ACORN·USER

BBC MICRO · ELECTRON · ATOM NOVEMBER 1984 £1

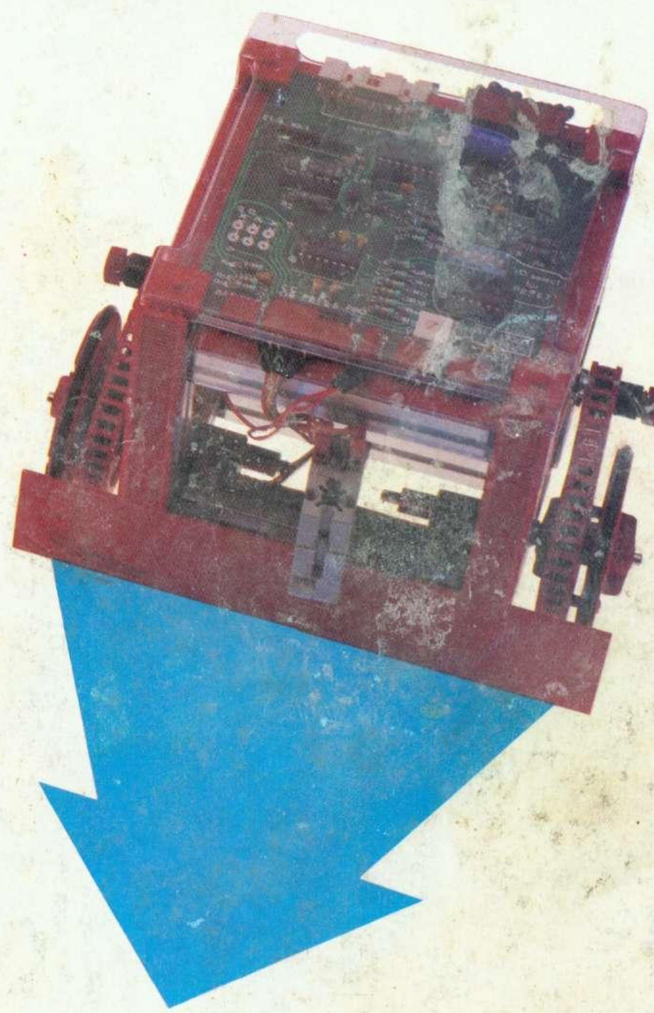
39 LEAF

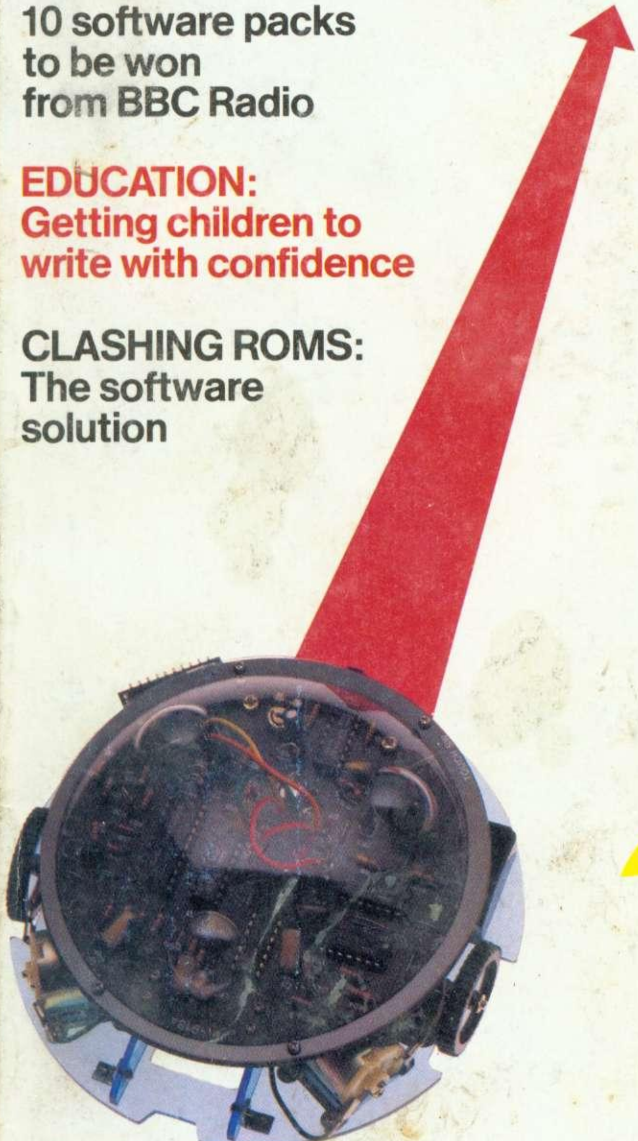
GREAT CONTEST!
Win a £66 computer desk

QUIZ FOR SCHOOLS:
10 software packs to be won from BBC Radio

EDUCATION:
Getting children to write with confidence

CLASHING ROMS:
The software solution





BUGGIES
SIX OF THE BEST



REVIEWS:
Two digitisers to trace pictures

MICRO LIVE ON TV:
Behind the scenes with the Producer

SPECIAL OFFER: CUT-PRICE INSURANCE FOR YOUR MICRO

AMX MOUSE

POINTS THE WAY TO...

- **Faster interaction**
- **Creative Graphics**
- **Enhanced Programs**

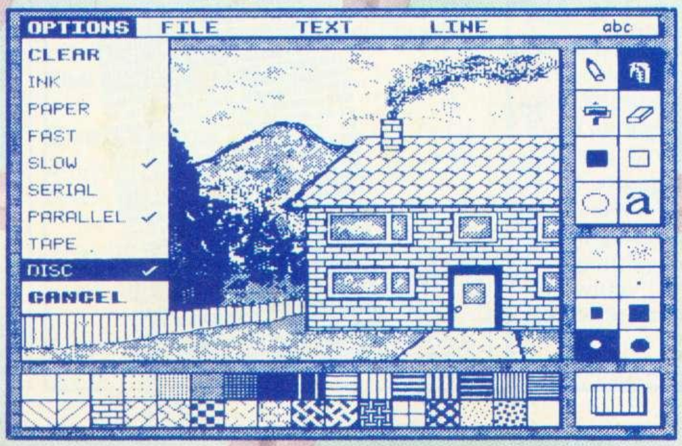
With the AmX Mouse, from Advanced Memory Systems Ltd, the BBC Micro joins a new league of powerful user-friendly computers. Natural hand-eye co-ordination allows the MOUSE to position the cursor quickly and accurately. Alternatively by moving the MOUSE you can input specially written new software such as ArtworX.

ArtworX is a powerful graphics program allowing scope to produce amazingly vivid pictures and designs on your screen and printer. Simply point to any of the ICONS (small illustrations) and you select options of patterns and implements. Other options are offered by pull-down menus. All features can be activated using just the MOUSE.

The AmX Mouse package includes ArtworX and an EPROM with software to enable you to use the MOUSE with existing programs and also lets you use the MOUSE's versatility in your own software. Just plug the MOUSE into the user port on a BBC Micro (model B) and the EPROM into a spare sideways socket.

Now simply fill in the coupon and we will send you an AmX Mouse with ArtworX with our full no quibble money back guarantee. OR phone 0925 602690/62907 for instant Access or Visa orders.

ArtworX graphics program



Please send No________ AmX Mouse packages (including ArtworX and EPROM) at £89.95 inc. VAT and P&P.
I enclose a cheque/PO for £__________ or debit my credit card.

Card No ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ ☐ Visa ☐ Access

Name ______________________

Address ______________________

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Signature ______________ Date ________

(Please tick choice of media for ArtworX) ☐ Cassette ☐ 3" Disc ☐ 5¼" Disc

To: Advanced Memory Systems Ltd., Woodside Technology Centre, Green Lane, Appleton, Warrington, WA4 5NG, England.



November 1984 **No 28**
Cover photograph by John Barlow

THE ONE AND ONLY BBC, ELECTRON AND ATOM MAGAZINE

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Acorn User welcomes submissions from readers. Articles should be typed, double-spaced text, with diagrams on separate sheets. Please enclose programs on disc or cassette, with a listing if possible. Photos should be 35mm, or larger, transparencies, or 5in by 7in black and white prints. Ensure your name is on everything. Please include a suitable stamped, addressed envelope for return. Articles are acknowledged on receipt.

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New Users

Features

Communications

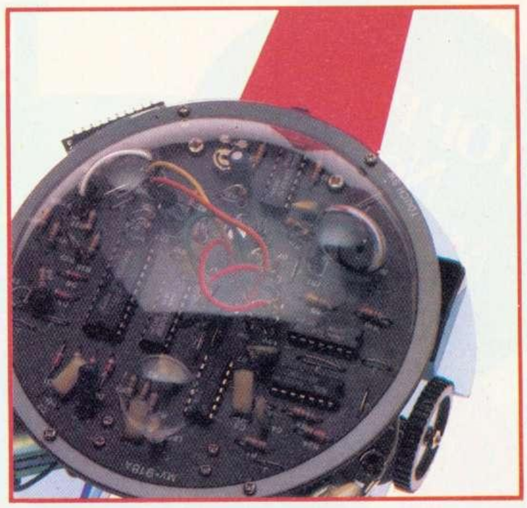
Education

Atom

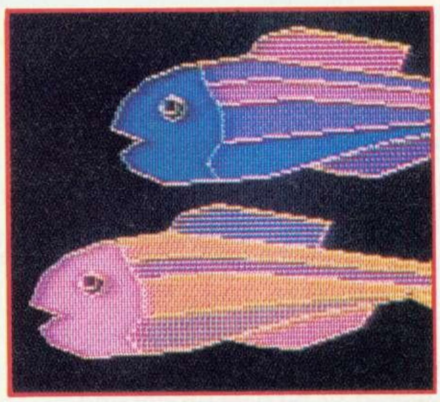
Yellow listing pages

You'll find all the main listings of this issue in the yellow pages

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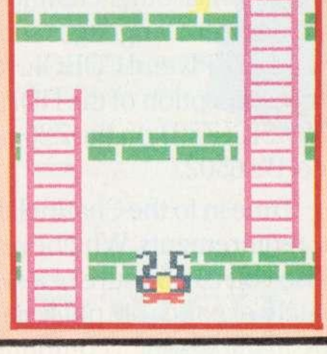
NEXT MONTH. . .

Database special
Find out how they work, type in your own, and read about six commercial versions

Build an organ
An early Christmas present as Joe Telford takes you step-by-step through building a musical keyboard

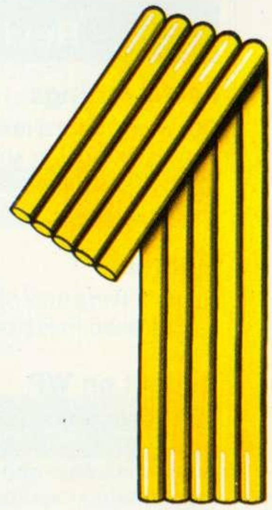
Printing screens
Dump those pretty games in colour or black-and-white

Bar code listings
Find out about this foolproof method of inputting software



Unicorn. Five new c
Here's the full p





The ZEP 100

- Z80 Extension Processor
- 4MHz Z80A
- 64K RAM
- 24K ROM

The object of any upgrade kit is to improve processing ability and to increase data storage capacity. The UNICORN ZEP100 is the first stage upgrade which opens channels into the world of serious computing.

The ZEP100 is the proven 8 bit second processor for the BBC Model B micro. A Z80 extension processor which enables the use of the well established CPN operating system, giving access to the vast range of applications programs and languages available for all CP/M® micros. When fitted to a BBC model B microcomputer with compatible high quality disc drives it provides a complete business or scientific computer which can run large applications programs or use advanced languages, with the ability to switch back to standard BBC programs at any time.

Any ZEP100 can be linked, via the Econet® option on the BBC, to a network of other TORCH computers to provide a workstation running on TORCHNET. Full TORCHNET operating systems software is provided to allow access to information anywhere on the network, or to communicate with other computers.

The 64K ZEP100 is supplied with full software support including word processing, spreadsheet, database and utilities. **The ZEP100 – around £299 (ex. VAT).**

The new UNICORN range from TORCH Computers gives the enthusiast and professional user a choice of upgrades which takes the BBC Model B Micro to the ultimate height of performance.

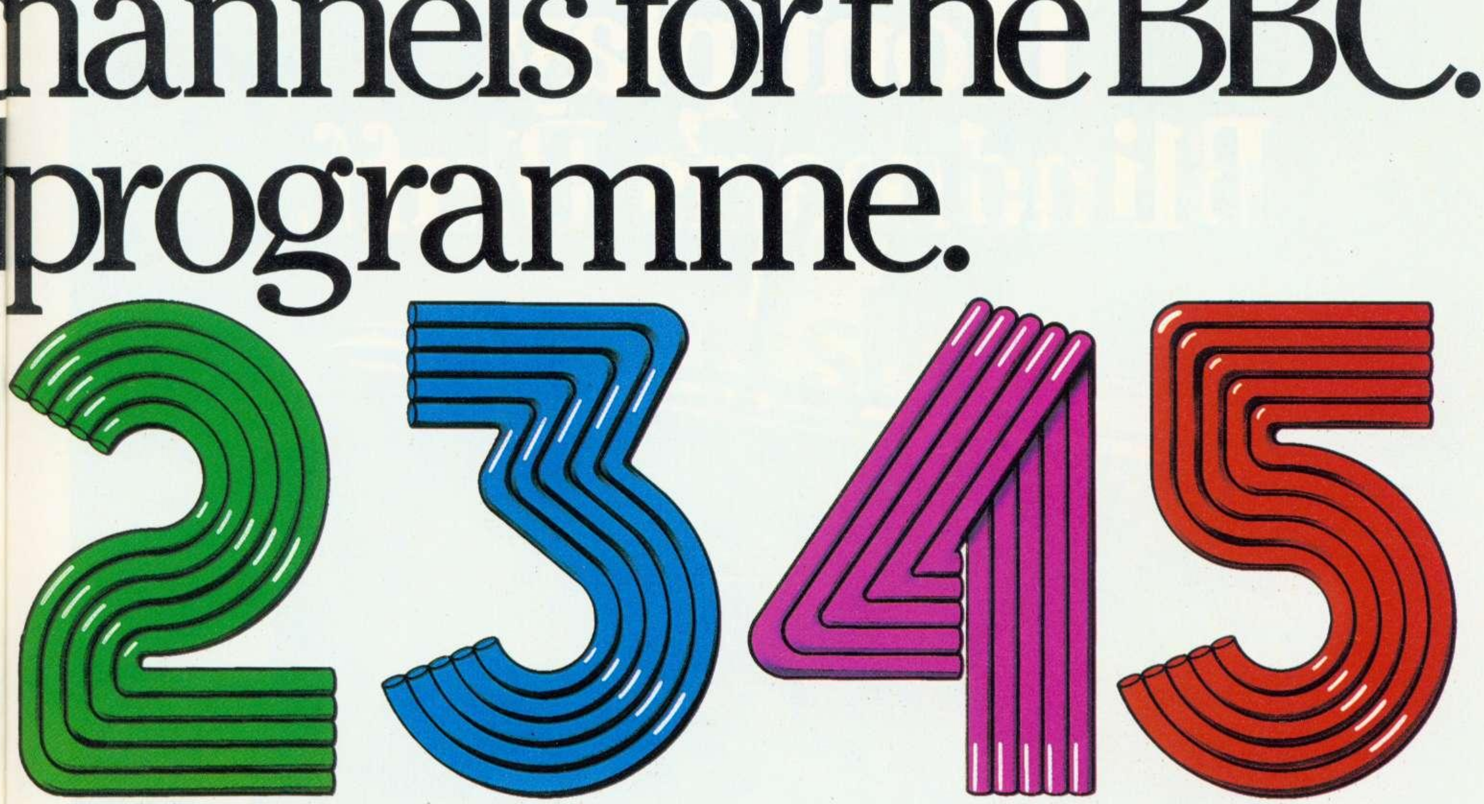
The result of TORCH'S total commitment to the BBC Micro is the only complete range of high performance hardware available. Offering every BBC Micro owner five new upgrade channels, UNICORN will transform your BBC into a fully communicating workstation, a CP/M® compatible business machine or the ultimate in high powered 32-bit data processing.

At the top of the range, THE UNICORN, offers the power and sophistication of System III UNIX® whilst other channels make available the flexibility of languages such as FORTRAN, PASCAL, BCPL and COBOL. All models, with the exception of the HDP240, provide BBCBASIC(Z80) on the Z80 rather than the Model B's 6502.

Tune in to the Channel that most suits your requirements. Whichever level you choose you can be sure of a system with infinitely expandable potential for a confident future in the world of computing.



channels for the BBC.
programme.



The ZDP 240

- 4MHz Z80A ● 64K RAM
- 24K ROM
- Twin, double sided 400K floppy discs
- Independent integral power supply



The UNICORN ZDP240 (Torch Z80 Disc Pack) is the proven upgrade for the BBC Model B micro-computer. Offering the use of more powerful and flexible languages such as Fortran, Pascal, BCPL and Cobol, it provides 800K of disc storage plus a Z80 second processor with 64K RAM running TORCH's own CP/M® compatible operating system based in ROM.

This advanced design means that almost all of the 64K RAM provided by the Z80 board is available for CP/M® programming use – an advantage no other BBC micro upgrade can offer.

If your BBC micro has the Econet® option, there is a further benefit the ZDP240 can offer. TORCHNET can link together up to 254 upgraded Model B's on a local area network, so for enthusiasts, Clubs and Schools it is a simple and low-cost way to achieve networking facilities.

The discs can be used for storage under the Acorn DFS system or for CP/M® programs and data.

A comprehensive software package is provided with the disc pack. It includes word and data processing and a spreadsheet program, along with utility programs and manuals.

The TORCH Z80 Disc pack is recommended by the CCTA for government use. **The ZDP 240 – around £699 (ex. VAT).**

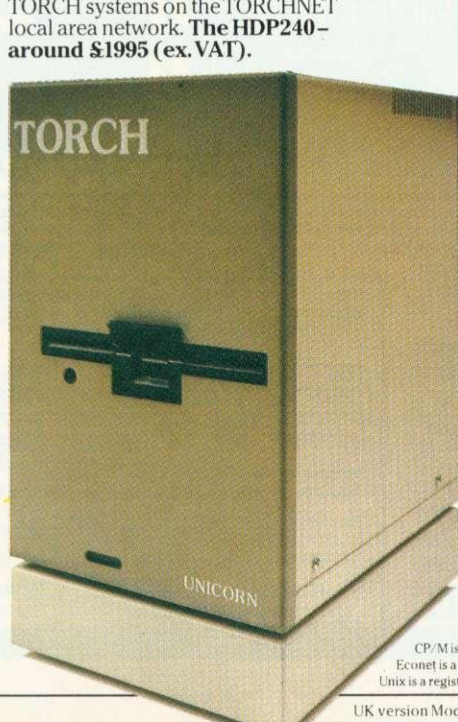
The HDP 240

- 20Mbyte hard disc Winchester
- Double sided 400K floppy disc
- Integral power supply

For users who need much more storage capacity than is available on floppy discs and who require the large speed gains that a Winchester hard disc provides, the third new channel is now available.

The UNICORN HDP240 combines a 400K floppy disc drive with a 20Mb hard disc and its associated controller. The pack connects directly to the disc and 1MHz bus sockets on the BBC Model B.

In conjunction with a ZEP100, it provides a powerful business computer for running CP/M® programs with large amounts of data. The floppy disc can be used for storage with the Acorn DFS system, and both discs can be used by other TORCH systems on the TORCHNET local area network. **The HDP240 – around £1995 (ex. VAT).**



The HDP68K

- 8MHz MC68000 ● 6MHz Z80B
- 256K RAM (68000)
- 64K RAM (Z80)
- 20 Mbyte hard disc Winchester
- Double sided 400K floppy disc
- Integral power supply

The fourth channel in the UNICORN range is for users who need the extra processing power of a 68000 32 bit processor, as well as the Z80 running standard software. The UNICORN HDP68K provides the ultimate in performance, offering an extra 256K RAM and a 68000 processor running at 8 million cycles per second. It also contains a Z80 processor to allow the running of existing TORCH software.

The HDP68K – around £2495 (ex. VAT).

The Unicorn

Spec. as HDP68K PLUS UNIX® operating system. Single-user or Multi-user

UNIX® System III is the recognised operating system of the '80's. A very powerful and sophisticated multi-tasking system, it includes a vast library of utility programmes.

The fifth channel and top of the range, THE UNICORN, puts UNIX® within reach of the individual user, at a price unmatched by any other UNIX® systems, by combining the reliability of the BBC micro with advanced technology from TORCH.

TORCH UNIX operates under the network operating system. Using UNICORN products, a low-cost network of BBC Micros can be configured to offer the most complete range of educational computing facilities available anywhere.

Other facilities available include UCSDp-System, LISP, FORTH, PILOT and PROLOG. **The UNICORN – from around £2895 (ex.VAT).**

UNICORN

Open channels for the BBC micro.

To: Torch Computers Ltd., Abberley House, Great Shelford, Cambridge CB2 5LQ.
Telephone: Cambridge (0223) 841000.



Please send further information on the UNICORN range plus your FREE 1984 Software Catalogue.

Name ______________________

Address ______________________

____

AU11

TORCH COMPUTERS

CP/M is a registered trademark of Digital Research Inc.
Econet is a registered trademark of Acorn Computers Ltd.
Unix is a registered trademark of Bell Telephone Laboratories Inc.

UK version Model B necessary.
Disc interfaces are necessary for use with the Unicorn range.

Text and Graphics provided by BBC Model B.
Keyboard provided by BBC Model B.

Acorn User part of India aid package

ACORN USER is part of a £1.2m gift to the Indian Government to introduce computing to schools. The funding comes from the Overseas Development Association as part of a British aid programme.

The scheme includes 900 BBC micros with Microvitec monitors, disc drives, printers and 50 different software packages. It came about as a result of the Queen's visit to India last year and her gift of 30 Beebs to the Indian Government with Econet networking systems.

Queen's visit

Chris Bartel of the British Council, which is running the scheme for the ODA, explained: 'The impetus came from the Indians, mainly the Department of Electronics. The Queen's visit certainly helped.'

The first part of the ODA project was a visit earlier in the year by nine British teachers – *Acorn User* author Martin Phillips among them – to train Indian counterparts in the country's regional resource centres.

They had been preceded by 170 BBC systems, most of which survived the journey and the heat. 'Everything seemed to work splendidly,' said Bartel. 'The only problem was that some of the monitors were not packaged well enough.'

Vital

The remaining micros and other hardware, with software – and several hundred *Acorn Users* – were due to have gone out last month. The make-up of the support package was fixed by a working party which decided that software and back-up through magazine subscriptions were vital.

An Indian delegation has been over to Britain to see the way micros are used here. As a result they decided to stress computer literacy rather than using the machines as an aid to teach other subjects.

Bartel said: 'The first machines have been sent to the resource centres, and there are none in schools yet.'

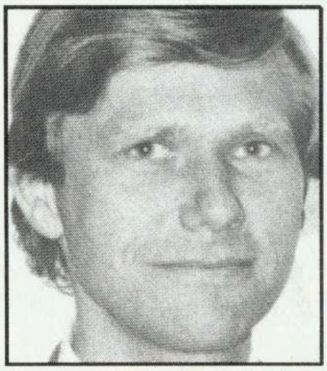
ABC excites, but Acorn shares drop

ACORN's new range of business machines were barely a week out of their boxes last month before the company's shares slumped to an all-time low of 107p on the Unlisted Securities Market – well below last year's entry price of 120p.

The drop was nothing to do with the ABCs, which went down well at the PCW Show (see page 30), but with Acorn's profit results for the year. Although turnover more than doubled to £93m against £42m last year, profits rose by barely 20 per cent from £8.6m to £10.8m.

While Acorn Chairman Hermann Hauser was pleased with 'better than expected' sales and profits in the UK (£85m and £14m), losses caused by Acorn's entry into the US brought the figures down.

Acorn is rethinking its tactics, having sent former northern sales boss Joe Black over to sort things out. Also a new president has been appointed. However, Hauser was convinced the basic approach was right and that the company had merely been too optimistic about early sales.



Hauser: 'others talk, we do it'

'We've a sound foundation in the US and overseas,' said Hauser, 'and have established a name and reputation for quality and design.'

He was confident that this reputation and investment would pay off and result in 'a worthwhile share of the US market' within 'an acceptable timescale.'

The Acorn chairman was far more at home expounding Acorn's plans for the 'office machine for the future' expected to result from investment in a research house in Paulo Alto on the edge of California's Silicon Valley. This outpost is known as Acorn West and the concept is linked to Acorn's venture with BSR to produce a small, inexpensive laser disc – essential for the office of the future, said Acorn's managing director Chris Curry.

Acorn is expecting another boom this Christmas to boost sales of the BBC, presently at 370,000, and the Electron which has sold 90,000, despite 'production delays' last year.

The Acorn board reckoned that 55-60 per cent of sales were achieved in the four months prior to Christmas, but expected the ABC machines and increased sales overseas to give a more balanced profile over the year.

Although sales director Peter O'Keefe pointed out that the ABC would not meet IBM 'head-on', Hauser was more bullish in dealing with Sinclair Research when talking about Acorn's VLSI chip design department. When it was pointed out that Sinclair had his own plans in that area, Hauser commented: 'May the best man win.'

He then went back to a comment made just a few minutes before about VLSI and added: 'You can infer from what I said earlier – others talk about it, we do it.'

History in the making on page 97

HISTORY is being made this month with the publishing in *Acorn User* of barcode listings for the first time in a British computer magazine. It is part of a trial to establish the best way to present listings before the MEP-backed project starts in earnest.

Once equipped with a reader, users will be able to input program listings without having to laboriously type them in.

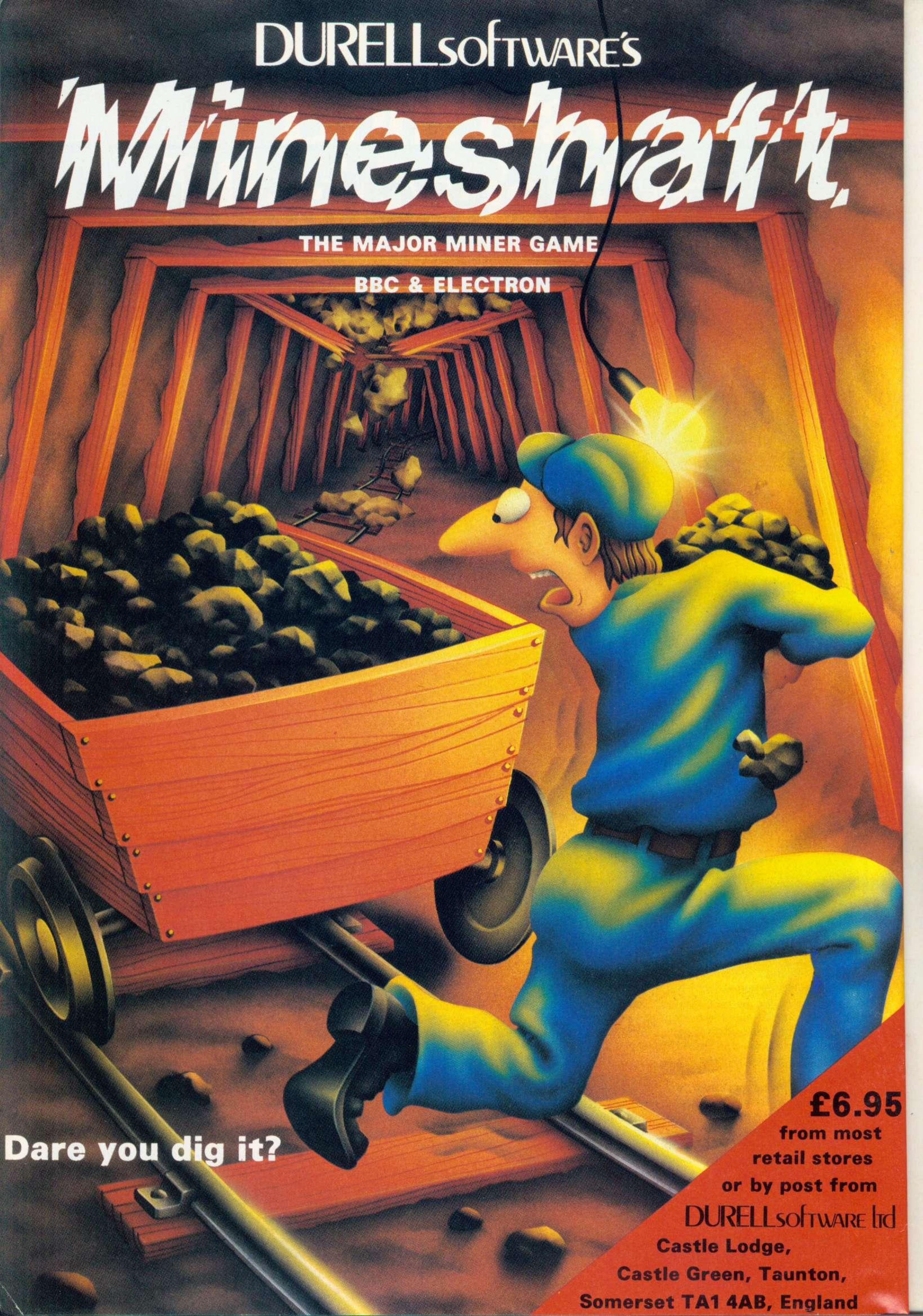
The advantages of this, especially for children and people new to computing, are immense. It offers a cheap way of distributing software without recourse to cassettes or discs. And you will be able to print out your own programs and data as barcodes.

Acorn User has worked closely over the last year with the Microelectronics Education Programme (MEP) in developing the hardware and software to bring out a total package for under £50. Previously, the barcode reader alone has cost at least £80 from other manufacturers.

The package will be published by Addison-Wesley at the end of November complete with booklet, written by *Acorn User* author George Hill, and software. Next month we will explain how barcodes work and how they could influence the way you use a computer.

Addison-Wesley will be exhibiting the readers at the Schools Computing Exhibition on November 6-7 in London's Bloomsbury Crest Hotel.

In the meantime, there's a little competition (one of *three* in this issue) for those who can decipher the Telepen format listing on page 97 and tell us which program in the yellow pages it represents. And, especially for those people who want to be the first with everything, the prize is – a barcode reader! And look out for next month's competition, too.


DURELL software's
Mineshaft
THE MAJOR MINER GAME
BBC & ELECTRON
Dare you dig it?
£6.95
from most
retail stores
or by post from
DURELL software ltd
Castle Lodge,
Castle Green, Taunton,
Somerset TA1 4AB, England

Touch tablet for software

TOUCHMASTER is a graphics tablet for the Beeb which can be used as a touch-pad input device (see picture). The A4-sized pressure-sensitive tablet offers a 256 by 256 resolution and drawing is done with a small stylus.

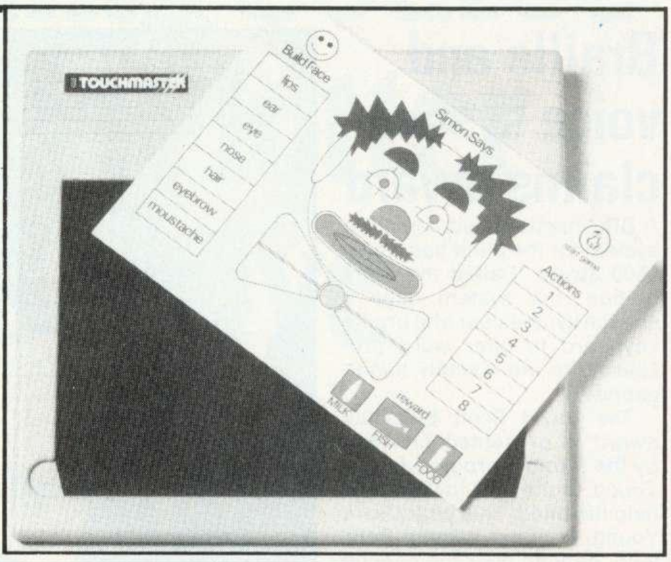
However, load in suitable software and slide a paper overlay on top, and the Touchmaster becomes a series of touch-pads – press one box for 'yes' and another for 'no', for example. The device costs £149.99, plus £4.99 for the Beeb interface.

Touchmaster is backed by a series of 'fun learning' programs. These are of the 'Simon Says' variety where young children press various boxes on the overlay in response to questions on the screen.

Other programs include: Draughts, Othello and Alien Break-In – all at £9.99. Included free with the tablet is Multipaint, a graphics package with routines for drawing circles and boxes.

The tablet is produced by a company set up in the factory formerly used by Dragon.

Contact Touchmaster at PO Box 3, Port Talbot, West Glamorgan, SA13 1WH.



Wordprocessing update for Atom

THE latest version of the *Editor* wordprocessing ROM includes the ability to insert control characters anywhere in a text line (without upsetting justification) and a facility to spool consecutive text files from disc, using *<filename> commands.

In addition, software is included to allow disc users access to direct-typesetting facilities. New embedded codes allow you to specify up to 200 different fonts and, having created and formatted your text using the *Editor*, the disc is then sent to the typesetters.

To use this facility you pay a premium of £15 (plus VAT), which gives you the enlarged manual and a licence registration. For non-Atom users interested in a cheap camera-ready medium, Bear Hardware has a limited number of complete Atom systems available.

Also from Bear Hardware, by arrangement with Acorn, you can now get the f.point and DOS ROMs.

Finally, from this busy company, comes news that it is working on a universal disc interface (which will work with the Atom), allowing single/double density on up to eight surfaces. The company hopes to have this available for Christmas and price is provisionally set at around the £100 mark.

Details from Bear Hardware, 68 Harmondsworth Lane, Harmondsworth, Middlesex UB7 0AA, tel: 01-897-3059.

Torch develops Unix network for BBCs

by Geoff Nairn

TORCH Computers has developed a Multi-User Unix system to run on the BBC micro. Up to eight Beebs can be connected to a Torch Unicorn, allowing each user to run programs under the sophisticated Unix operating system.

At less than £15,000, Torch considers the system a bargain, as a similar set-up running on a minicomputer would cost at least £50,000.

At the heart of the system is the Unicorn, which contains a 20Mb hard disc and 68000 processor to run Unix (see September's issue). Each Beeb has a Unix terminal ROM inside and the Beebs are connected to the Unicorn using the Econet local area network.

In addition to the Unix packages, the Torch system has an electronic mail facility which allows users to 'talk' to other Unix systems through modems over the phone lines.

'The beauty of our system,' said Torch's Colin Alton, 'lies in its total compatibility and transportability. We are using Unix System 3, which has all the latest enhancements and is supported by AT&T (who first developed Unix). Other manufacturers have gone down the Xenix path, which doesn't enjoy AT&T's support.'

A smaller four-terminal network can be built for under £9000 and Torch is obviously looking to make a killing in a market which Colin Alton reckons is worth £100 million over the next year.

● Bleasdale Computers demonstrated BBC micros linked to minicomputer Unix systems at the recent Unix Systems 84 Exhibition in Cambridge.

More information from Francis House, Francis St, London SW1P 1DE.

Home possibilities of Econet

ACORN's two founders, Chris Curry and Hermann Hauser, have bought a stake in Meridian, a company working on computer control of appliances around the home.

Meridian, which made a name for itself with 'state of the art' audio equipment, has developed a hi-fi system whose parts can be physically separate and 'interfaced' together with a simple digital link. This is made possible by the system's digital circuitry.

The company intends to use Acorn's Econet as the link medium. According to Meridian's founder, Allen Boothroyd, the plans don't stop there: 'We have a research project working on the digital control of domestic appliances using Econet. It's a long way off but the possibilities are tremendous.'

If Allen Boothroyd's name seems familiar, he was responsible for the design of the BBC micro – his name is on the underside of each one. He left Acorn to found Meridian.

The two Acorn directors have each bought a 20 per cent private stake in Meridian and Acorn itself is not yet involved.

Son of Imagine launches games

A NEW company called Voyager Software has risen from the ashes of Imagine with two games for the BBC micro. *Forbidden Fruit* and *Grabbit* cost £6.50 each on tape and are the first titles the company has produced for the Beeb.

Voyager Software was set up by Tim Best and Mark Butler, who left Imagine just before it went bankrupt.

Voyager is at Unit 31, Wirral Business Centre, Gorsey Lane, Dock Rd, Birkenhead, Wirral.

Braille and voice system claims award

A BBC micro-based computer system for the blind has won a £500 award. Called the Work Station, the system uses a speech synthesiser and braille keyboard to offer word processing to the visually handicapped.

The David Scott Blackhall award is presented annually by the Radio 4 programme, *In Touch*, to the best invention to help the blind. This year David Young, Minister without Portfolio, handed over the cheque to Dr Tom Vincent, head of the Open University team responsible for developing the Work Station.

Dr Vincent described his system in the July 1983 issue of *AU*. It consists of a BBC micro; Perkins Brailler – a typewriter which punches braille; printer; and a voice synthesiser. Using the equipment, a blind person can type in braille and hear the text read back by the synthesiser, either sentence-by-sentence or word-by-word.

At the presentation, the Work Station was seen in use by blind pupils from the Pen-y-Bont School in Bridgend, Glamorgan who have been testing the system.



David Young, Tom Vincent and blind schoolgirl Wendy Kerton

Buzby swoops to conquer

BRITISH Telecom has moved into software publishing with a range of games titles selling for just £2.50. Firebird is the name on the label and the first four BBC micro titles are: *Bird Strike, Gold Digger, Duck!* and *Acid Drops* – all arcade games.

As well as the low prices, the games will bear a screen shot on the cassette cover, rather than an artist's impression. Said BT's Richard Hooper: 'Firebird software is setting new standards in a market where complaints about prices and misrepresentation are frequent.'

These first programs will be followed by a series of 'premium range' titles which will be priced individually – presumably they will also cost more. The titles will be available from dealers.

India takes on Beeb assembly

by Geoff Nairn

A DEAL struck with the Indian Government could see BBC micros in 250,000 Indian schools by 1990. Moreover, the machines will be made in the Punjab by the state-owned company Semiconductor Complex Ltd.

Initially, model Bs will be assembled from Acorn kits, but full-scale manufacturing will follow. Even the 6502 processor chip, at the heart of every Beeb, will carry the 'Made in India' stamp: Semiconductor Complex will manufacture it under licence from the American Rockwell Corporation.

The only components which the Indians cannot supply are the custom-built ULA chips: they will continue to come from Acorn.

The commitment to have a BBC micro in 250,000 schools is part of the Indian Government's five year development plan and was influenced by the Queen's recent gift of 30 Beebs to Indian schools.

Acorn stands to do quite well out of the deal for, apart from producing the vital ULA chips, the company also gains a useful – and possibly cheaper – second source of 6502 chips.

A similar agreement has been reached in Mexico, where Harry Mazal – a large Mexican computer company – will produce BBC micros for the whole of South America.

The machine used will be the American version of the model B which has a different power supply and television picture standard. It will be further modified with a Spanish-language keyboard and operating system ROM. As with the Indian company, Harry Mazal will initially assemble the Beeb from a kit of parts, but a manufacturing facility will come later.

Plans for China

Acorn's sights are now turned on China – a potentially huge market as a quarter of the world's population live there. Plans are afoot to produce the Beeb in Hong Kong exclusively for the Chinese market and in April of this year Acorn demonstrated the machine in Peking.

In both China and India, the consumer markets are comparatively small, but, as the Indian deal shows, the educational and industrial sectors are massive. And both countries are crying out for western technology.

Double density discs from Opus

OPUS has released a double density disc interface for the BBC micro fitted with a 1.2 OS. The kit costs £129.95 and increases the storage capability of a normal 40 track disc from 100k to 180k.

Discs are formatted with 18 sectors per track with each sector capable of holding 256 bytes of data. Discs formatted with the standard 10 sectors per track may be used as usual with the DDOS.

By using the first track of the disc to store the file directories on the disc, eight directories (called volumes) of 31 files are possible. This increases the files per disc from the Acorn standard 31 to a maximum of 248 files.

The 16k DDOS EPROM includes a number of utilities: format and verify, tape to disc transfer, automatic 40/80 track selection and mass copying routines that allow automatic copying of files between 40 and 80 track discs.

No-penalty DFS

MRM Software has grabbed back precious RAM for disc users with the introduction of its E00 DFS.

The DFS uses the standard 8271 disc controller chip and returns the 2.75k of RAM normally pinched by the DOS by resetting the value of PAGE back to &E00. This is done by providing 'on-board' assembly. The board is fitted in place of the standard DFS, with a link to another chip.

All commands are the same as the Acorn DFS except that only four files can be open at any one time (as opposed to the normal five), and the *BUILD command is restricted to less than 100 characters per line.

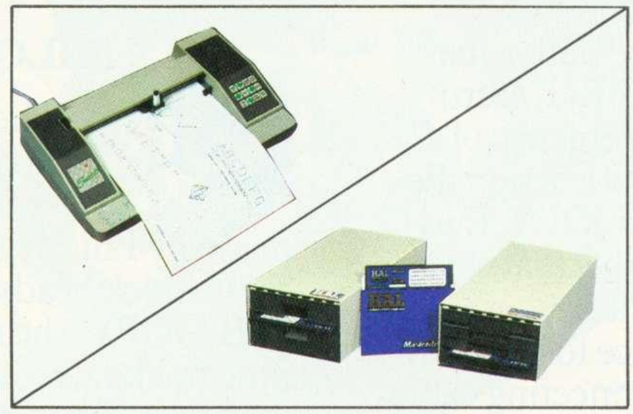
The E00 DFS costs £24.95, with a £5 refund to anyone buying the E00 DFS and returning the old DFS EPROM. MRM can be contacted at 17 Cross Coates Road, Grimsby, South Humberside.

Link to Crawler

AN INTERFACE enabling the Memocon Crawler (see Buggy review) to be programmed from the BBC micro is now available.

The price of the lead and cassette is £6.95 from Red Giant Software, 3a Oakcroft Close, Pinner, Middx.

A Free Training Course with Every Plotter or Disc Drive



Our Sweet-P, high resolution graphics plotters come with free computer based demonstration and instruction programmes which not only show you what the plotter can do, but teaches you how it does it. Our high quality floppy disc drives are supplied with a utilities disc that includes not only the usual file handling and operating software, but a teaching programme for each utility as well. HAL makes it easy for you to upgrade and teaches you how to get the best from your system.

Plus a full line of BBC compatible products

100 CPS Matrix Printers
HIGH QUALITY



LOW LOW PRICE

Nashua Floppy Discs



Reference	Description	Price per 10
MD1	SSSD	21.30
MD1D	SSDD	22.75
MD-2D	DSDD	26.95
MD-1F	SSDD 96 TP1	30.05
MD-2F	DSDD 96 TP1	31.25

Monitors-Monochrome



1984 Schneider Trophy Winner
H.A.L. COMPUTERS LIMITED

HAL Computers Limited,
Invincible Road, Farnborough,
Hants. GU14 7QU
Telephone: (0252) 517171

To HAL Computers, Invincible Road, Farnborough, Hants. GU14 7QU
Please send me:

Quantity			Delivery & VAT	Total
	Sweet-P Plotters plus support pack & software at	£575.00	£96.00	£671.00
	*200K double-sided disc drives at	£216.00	£42.20	£258.20
	KDC FT 5001 Matrix printers at	£249.00	£47.15	£296.15
	TECO Monochrome monitors at	£ 99.00	£24.65	£123.65
	Nashua model .... diskettes at £...... per box of 10 + 60p per box postage & VAT			

Free details on HAL's BBC Micro compatible products plus a commemorative Schneider Trophy winner's poster. ☐ Please Tick *Other capacities also available

I enclose a cheque for £ ______ or debit my Access Account No: ______

Name ______ Address ______

Tel. ______ Signature. ______

AU11

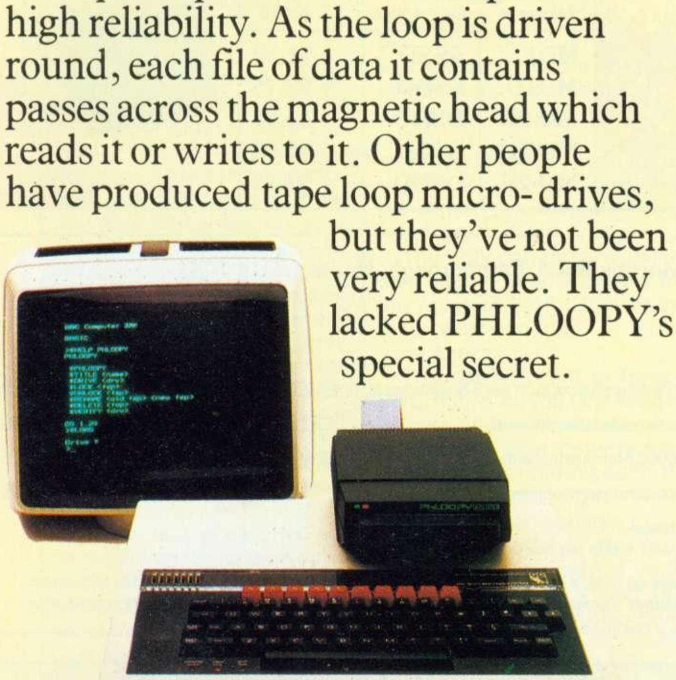
EUREK

A 100k BBC-drive for £99 + VAT

We've done it! We've built a mass storage system for your BBC Micro with the power and convenience of a floppy disk drive, but at a fraction the price. Get to know PHLOOPY, the remarkable new 100k drive that costs only £99 plus VAT, and a further £26 plus VAT for the interface to your BBC, operating system and connecting cables.

How PHLOOPY does it

PHLOOPY does not use disks to store data, but a 12-foot loop of professional-quality quarter-inch magnetic tape contained in a robust cartridge. The drive has only one moving part, the motor which drives the tape loop – hence the low price and high reliability. As the loop is driven round, each file of data it contains passes across the magnetic head which reads it or writes to it. Other people have produced tape loop micro-drives, but they've not been very reliable. They lacked PHLOOPY's special secret.



PHLOOPY's special secret



The heart of the invention is a brilliantly designed "byte-wide" magnetic head, made by Phi Magnetronics who build multi-track heads for professional use. PHLOOPY's head records and reads nine tracks across the width of a quarter-inch tape. That means the tape loop can be much shorter, so the typical time to access a file is reduced to a mere 3 seconds. If you're used to waiting for a cassette tape to trundle programs into your BBC, you'll be amazed at PHLOOPY's performance.

Getting it right every time

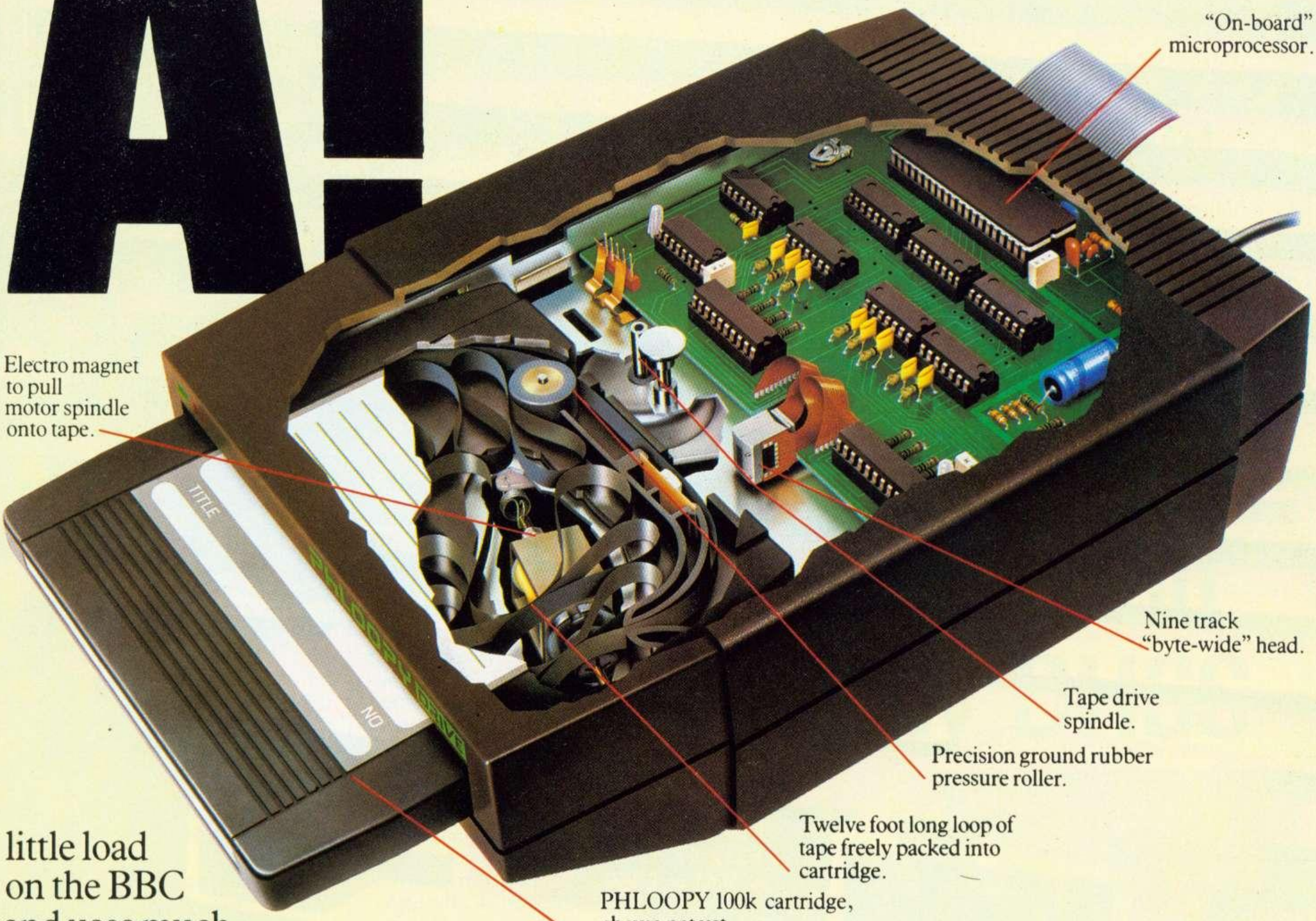
In addition, we've included a feature we know you will appreciate. PHLOOPY has full error detection and correction, so you can be certain you will get back what was originally written onto the tape.

Talking to your PHLOOPY

PHLOOPY's own software, contained in ROM, responds to standard BBC filing system and Basic commands. Most programs written to run on disk or cassette should run on PHLOOPY without problem.

And because PHLOOPY contains its own intelligent microprocessor – a second computer which does most of the hard work – PHLOOPY puts very

KA!



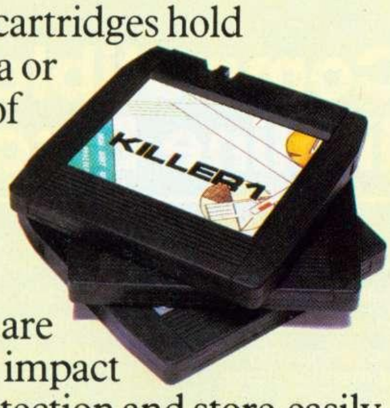
little load on the BBC and uses much less RAM than most disk systems.

Installing PHLOOPY on your BBC

You'll be amazed how simple it is to install PHLOOPY. Just plug in the interface cut two resistors (clearly marked in the instructions) and the job is done. If you should have problems our engineers are waiting to help you.

Making a PHLOOPY Library

PHLOOPY cartridges hold a full 100k of data or programs. Two of them come free with the drive and extra ones cost £3.75 each plus VAT. They are moulded of high impact polymers for protection and store easily on a bookshelf. Many programs will be available to purchase on PHLOOPY.



Phi Mag Systems Ltd.
PO Box 21, Falmouth,
Cornwall TR11 3TD.
Telephone: (0326) 76040.

Order Form

- Please send me further details about the PHLOOPY 100k data storage system for the BBC Model B.
- Please send me________(qty) PHLOOPY starter pack(s) for my BBC Model B microcomputer, including PHLOOPY drive, BBC interface, leads, connections, operating system in firmware, manual, and two PHLOOPY 100k cartridges, at £147.75 each including VAT, postage and packing.
Amount £________
- Please send me______(qty) packs of 5 PHLOOPY cartridges at £19.75 including VAT, postage and packing.
Amount £______

I enclose a cheque/PO for £__________ OR Please debit my Access card: Number:__________

Your order will be acknowledged within 10 days, giving a delivery date.

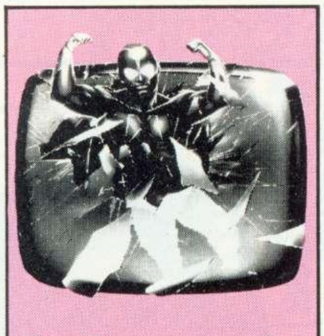
Name__________

Address__________

Town:__________Post code__________

Send this coupon to:
Phi Mag Systems Ltd, PO Box 21, Falmouth,
Cornwall TR11 3TD. Telephone: Falmouth (0326) 76040.
14 day money-back option.


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BBC Compatible
Mitsubishi Slimline Disc Drives
These are high capacity, precision drives with dynamic clamping and very low power consumption. All drives are supplied with cables, a very comprehensive utility/format disc and a manual.
MD 400 – 400K (800K double density) 40/80 track switchable double sided single drive.
MD 800 – 800K (1600K double density) independently 40/80 track switchable double sided dual drive.
MD 800P – 800K (1600K double density) independently 40/80 track switchable double sided dual drive unit with built-in power supply and monitor stand.
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Welcome



Book approval for *AU* authors

THE Book Marketing Council has stamped its seal of approval on three books written by *Acorn User* authors. The three titles form part of the 26 books and software chosen for the Council's 'Mastering the Micro' promotion – 13 of them for the BBC or Electron.

Jim McGregor and Alan Watt wrote *Better Basic for the Electron* and *Graphics Programming on the BBC Micro*, both published by Corgi/Addison Wesley at £4.95. The other book chosen was Ian Birnbaum's *Assembly Language for the BBC Micro*, MacMillan, £8.95.

The campaign is aimed at bookshops who want a small but comprehensive range of books and, in the words of a Council spokeswoman, 'Each book was chosen as being outstanding in its field.'

Teachers' show

EDUCOMP 84 will be held on October 26/27 at Dulwich College, South London. The exhibition concentrates on educational software and is being run by the Independent Schools Microelectronics Centre but it is open to all teachers.

Entry will be £1 per person on the door or £2 per school in advance. Applications with cheque to: Educomp 84, Dulwich College, London SE21.

Who dares . . .

ANYONE buying Comsoft's latest game, *SAS Commander*, has a chance to win £50.

SAS Commander is an arcade-style game for the BBC micro and Electron in which you have to kill terrorists, storm buildings and rescue hostages. It costs £4.95 on tape from Comsoft, 7 Roman Drive, Leeds, West Yorkshire LS8 2DR.

Printer error *Taxan's KP810 centronics printer costs £299 and not £229 as stated in the October issue.*

Cabinet role for 1984 game

TOP people read *Acorn User*. We received a telephone call from the Cabinet Office, who wanted to get hold of a copy of *1984*, Incentive Software's game of government management. The program was reviewed in the September issue of the magazine by Geoff Nairn.

Fears that the Government intended to run the economy with a BBC micro and a £6 computer game were, however, unfounded. Keir Hopley, who works within the Cabinet Office's Training Division said: 'We run training courses for the whole Civil Service. Playing *1984* could become part of these courses, albeit lighthearted. The Division has just got a BBC micro but at the moment it's used mainly for statistics and the like.'

Incentive's latest game is Millionaire, a simulation of running a software company. Versions are available for the BBC B and the Electron at £6·50. It includes screen pictures of your current residence, which increases in size as profits grow.

Cabinet ministers, civil servants or anyone else can contact Incentive Software at 54 London St, Reading RG1 4SQ, tel: (0734) 591678.

Micros for doctors in trial by DHSS

by Bill Penfold

Acorn hopes to get a thorough medical examination – to discover whether its micros are just what the doctor ordered.

The Beeb looks set to be one of the machines tested by the Department of Health and Social Security in its search for a suitable computer system for your doctor's surgery.

And with its new £2,000 Doctors Package now ready, Acorn's hopes are clearly high that a departmental diagnosis will pass it A1 fit.

Invitations to around 40 computer suppliers throughout the country have gone out from the DHSS offering them a chance to take part.

The aim then is to whittle the choice down to 20 different systems and within a year come up with some down-to-earth comparisons.

For such a lucrative market of 25,000 GPs, there are already lots of competing systems on the market . . . and that's the problem. As Junior Health Minister John Patten explained when he announced the investigation, the DHSS wants to know 'which does the job best.'

The DHSS has dreamt up its own GP practice with some 10,000 surgeries on the register and intends to put each machine rigorously through its paces.

An outside firm of consultants has been hired to carry out the tests, and several doctors are taking part to think up the professional requirements that will really test the capabilities of the machines.

Mr Patten explained that the intention is not to come up with a 'best buy' for the family doctor or to endorse any particular system. Instead the idea is to give GPs objective information about the systems currently available.

Meanwhile are the boys in Cambridge devising a bench test for bedside manners?



A COMPUTER package of hardware and software has been designed to support your local doctor.

For £1999, Acorn is offering a BBC micro plus printer, monitor and disc drives with software to administer record keeping and repeat prescriptions.

The programs were written by two Bristol GPs and form the first part of a suite.

So next time you pop in for your pills, check whether it's repeat prescriptions they're running or Snapper.

Prestel link for GP system

PRESTEL's medical news and information can now be accessed by the Abies GP computer system, based on a BBC micro.

Pages are put on Prestel by Meditel, which is offering free communications software to doctors who buy a modem for their Abies system. This gives access to the Meditel pages and other viewdata networks such as Micronet.

In addition, the software will work with non-viewdata databases, such as the specialist Medline on-line information service, or the Telecom Gold electronic mail network.

Meditel is at 309 High St, West Bromwich, West Midlands, B70 8ND.

NOTICEBOARD

A bright new feature page to fill you in on showbiz gossip and upcoming events

Bird of Prey venture takes a dive

THE project to market a software game for the Beeb to complement the BBC TV serial *Bird of Prey 2* has been cancelled, with accusations of 'gross inefficiency' on the part of the BBC.

The Ipswich Computer Centre was commissioned by the BBC to write an adventure game that would use characters based on the TV programme's graphics sequences. Duncan Spencer of ICC says: 'The game was a full graphics adventure with multiple overlays. To be honest, it lends itself more to a Spectrum or Commodore 64 but the BBC obviously wanted it for the BBC micro.

'After we'd worked on it for 4½ months they still hadn't signed the contract and we decided to pull out. I put it down to a lack of communication and gross inefficiency on their part.'

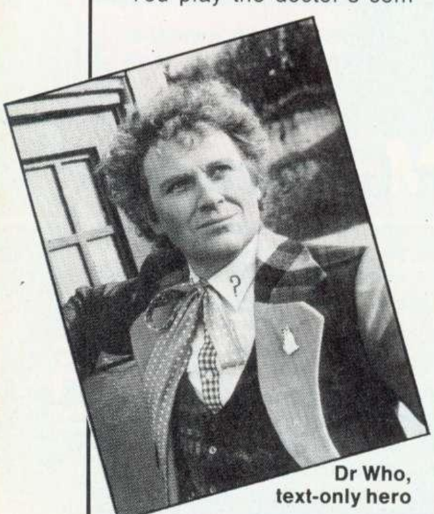
BBC Enterprises, which would have marketed the game, were not prepared to comment on the contractual problems but Bob Cosford, who designed the computer graphics for the series, says: 'It's just one of those things.'

You and Who

AUNTIE Beeb has had better luck on the software front with a new *Doctor Who* adventure game. The doctor has forsaken his traditional enemies, the Daleks, to do battle with warlords and bandits. The tape, *Doctor Who and the Warlords*, is produced by BBC Publications for the Beeb and Electron and will be available in the new year for £7.95.

You play the doctor's companion marooned on the planet Quantain in the distant future. Together you must defeat the evil warlords in this pure-text adventure. The program was written by AU contributor Peter Voke.

The original Dr Who software tape, which consisted of several poor arcade-type games programs, has been quietly dropped by BBC Publications.



Dr Who, text-only hero

Digital romance

MOVING from the small to the big screen, *Electric Dreams* opens this month. The film explores the familiar theme of the eternal triangle, but with the unlikely twist that one of the protagonists is a computer. Miles buys himself a micro and sets it to work composing love songs for Madeline – the girl musician next door. She thinks Miles is writing the songs and falls for him; meanwhile the computer gets jealous and . . .

With a soundtrack by Boy George and with Virgin Films producing the film, various commercial spin-offs are planned – though no computer game.

On television

Micro Live, BBC2, November 9, 6pm. Third programme in monthly series that features BBC micro heavily. Lesley Judd tries every which way to corrupt a disc, there's a lively discussion on telecoms and a live Bulletin Board session. Computer programs from the series are available as telesoftware on Ceefax.

First Class, BBC Scotland, Wednesdays 5.25pm. Quiz game with teams drawn from schools. BBC micros used for setting questions, keeping score and captions. Winning school gets a Model B with disc drive.



Lesley Judd goes down the Tube

On radio

Chip Shop, BBC Radio 4, 4.15pm Saturdays (repeated on VHF at 11pm Tuesdays). Second series featuring hardware and software reviews, letters spot, news reports. Barry Norman presents.

Radio 1 Chip Shop, BBC Radio 1, 7.33am Saturdays. Software broadcast on Saturdays and Sundays at 5.55am. 'Pop' version of above with Top Ten software charts.

Abacus, BBC Radio Leeds, alternate Tuesdays 6.45pm.

The Computer Programme, Radio Sussex, 3.45pm Sundays.

Action Station, BBC Radio Kent, 11.05am Saturdays.

Datarama, Radio West, 6.15pm Thursdays. (Also 7pm Sundays on Wiltshire Radio and Devon Air.)

Chips, Pennine Radio, 7pm Mondays.

BLUNDERBOX

IN the June issue on yellow page VII, line 140 of Paul Beverley's listing 2 should read:

```
140 IF (?M% AND T%) > 0 THEN VDU255 ELSE VDU32
```

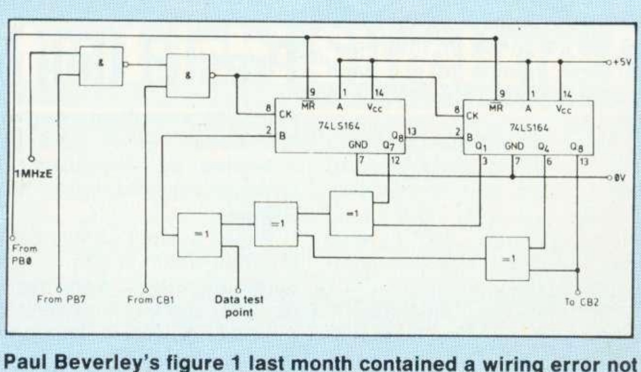
IN the July issue on yellow page VI, lines 310 and 640 of Mark Clayden's program should read:

```
310 LDX #8
640 LDA #8
```

To save the object code type: *SAVE INSPECT 8D0 9FF

IN the September issue the Sprite design program on yellow pages VIII and IX is too long to run as printed. The spaces after each line number should be deleted. The instructions for running the *Design* contain two mistakes: line 950 is printed twice and each time '1%' should, of course, read 'I%'.

READERS who bought the October listings cassette should note that line 620 of Alan Crabb's program contains an error. The printed listing is correct.



Paul Beverley's figure 1 last month contained a wiring error not unconnected with PB0. Here's the correct version.

Addresses and phone numbers

Acorn Customer Services 0223-210111

Retail Control Systems, Enterprise House, Central Way, North Feltham Trading Estate, Feltham, Middlesex, 01-844 1333

BBC Broadcast Support Services, 2 Cater Road, Bristol BS13 7TW. Technical Helpline, 01-993 0366.

Parfitt Electronics, 6 View Street, London N6, 01-348 1973 (See plotter review, September).

Wordsmith, 19 West End Street, Somerset, 0458-45359 (See news item, page 9, August).

Data Technologies Ltd, Century House, Market Street, Swavesey, Cambridge.

Unilab, Clarendon Road, Blackburn BB1 9TA. (See weather article box, page 31, August).

Notting Dale Information Technology Consultancy Unit, 189 Freston Road, London W10.

Rose-Morris, 32/34 Gordon House Road, London NW5 1NE (See news item, page 10, September).

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They include the amazing GP700A: the first full-colour matrix printer ever offered at under £350.

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And with 34 dealers nationwide, you shouldn't have to go too far to find them.

If you're not near a dealer you can order direct from us - just contact Pat Kelly on 0934 416392.

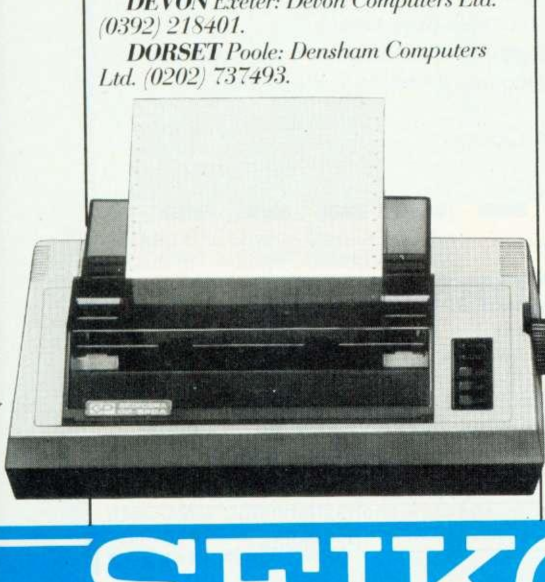


SEIKOSHA GP500A
Takes pin-fed paper up to 10" wide. 50 cps print speed. **£175.00**

SEIKOSHA DEALERS:

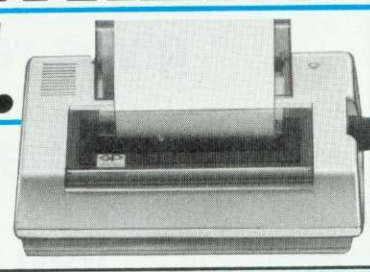
ENGLAND

BEDFORDSHIRE *Bedford: Bedford Computers. (0234) 215015.*
BUCKINGHAMSHIRE *High Wycombe: Kingsley Computers. (0494) 449749.*
CHESHIRE *Frodsham: Northern Computers. (0928) 35110.*
CUMBRIA *Carlisle: The Computer Shop. (Carlisle) Ltd. (0228) 27710.*
DEVON *Exeter: Devon Computers Ltd. (0392) 218401.*
DORSET *Poole: Densham Computers Ltd. (0202) 737493.*



DURHAM *Darlington: Darlington Computer Shop. (0325) 487478.*
ESSEX *Harlow: Akhter Instruments. (0279) 443521.*
GLOUCESTERSHIRE *Cheltenham: The Screen Scene. (0242) 528979.*
HAMPSHIRE *Portsmouth: Advanced Digital Services. (0705) 823825.*
HERTFORDSHIRE *Watford: Computer Plus. (0923) 33927.*
HUMBERSIDE *Hull: The Computer Centre. (Humberside) Ltd. (0482) 26297.*
LANCASHIRE *Burnley: IMO Computer Centre. (0282) 57411/54299.*
Lancaster: Castle Computers. (0524) 61133.
LONDON *W.1: Specialist Computer Centre Ltd. 01-935 4150.*
Eltham: The Advanced Technology Centre. 01-859 7696.
LINCOLNSHIRE *Grantham: Oakleaf Computers. (0476) 76994.*
MANCHESTER *Sumlock Electronics Services Ltd. 061-834 4233.*
MERSEYSIDE *Liverpool: Specialist Computer Centre Ltd. 051-236 3499.*
NORFOLK *Norwich: Sumlock Bondain. (0603) 617083.*
NOTTINGHAMSHIRE *Nottingham: Computer Market. (0602) 586454.*
SALOP *Telford: Computer Village. (0952) 506771.*
STAFFORDSHIRE *Stoke-on-Trent: Computer Cabin. (0782) 636911.*
SURREY *Croydon: Visionstore Ltd. 01-681 7539.*
Kingston-upon-Thames: Visionstore Ltd. 01-546 8974.

SEIKOSHA GP550A
Multi-mode printing (including correspondence-quality) at up to 50 cps. Takes pin-fed or friction fed paper up to 10" wide. **£229.95**



SEIKOSHA GP50A
Takes paper up to 5" wide. 40 cps print speed. A separate version, the GP50S is available for the Spectrum. **£99.95**

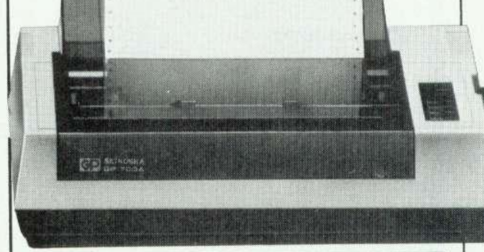
SUSSEX *Worthing: Worthing Computer Centre. (0903) 210861.*
TYNE AND WEAR *Gateshead: H.C.C.S. Associates Ltd. (0632) 821924.*
WEST MIDLANDS *Birmingham: Specialist Computer Centre Ltd. 021-643 4743.*
Coventry: Coventry Micros. (0203) 58942.
WEST YORKSHIRE *Bradford: Eltec Computers. (0274) 722512.*
Leeds: Microcell. (0532) 449722.
WILTSHIRE *Trowbridge: Trowbridge Computer Shack. (02214) 57299.*

SCOTLAND

GLASGOW *Exchange Computers Ltd. 041-424 4242*

WALES

CLWYD *Abergele: Abergele Computer Centre. (0745) 826234.*



SEIKOSHA GP700A
Gives excellent colour printout in 7 colours and 30 shades in one pass, on pin or friction-fed paper up to 10" wide. Prints text at up to 50 cps. **£349.95**

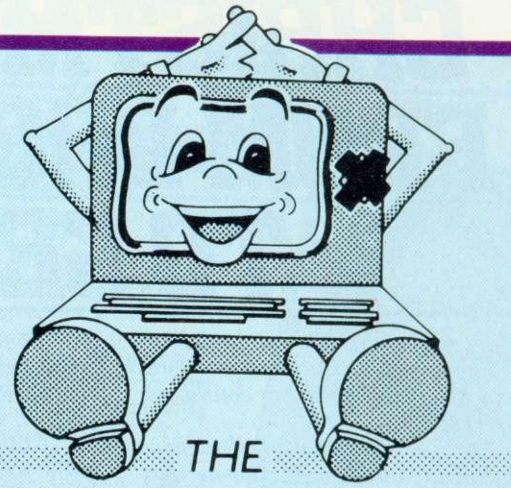
Please send me more information and an order form for:
GP50A ☐ 50S ☐ 500A ☐ 550A ☐ 700A ☐
Name ____________
Address ____________
____________ *Postcode* ____________
Access VISA AUS

SEIKOSHA DRG

DRG Business Systems, Dealer Division, 13/14 Lynx Crescent, Winterstoke Rd, Weston-Super-Mare BS24 9DN. Tel: 0934 416392. Telex: 444761.

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gives readers the chance to join the MICRO REPAIR CLUB at a major discount



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	Normal price	AU price
1 year	£24.95	**£19.95**
2 years	£35.95	**£27.95**
3 years	£46.95	**£39.95**
4 years	£57.95	**£49.95**

All these prices include VAT at 15%

THE Micro Repair Club has been set up to ensure that users of Acorn computers make the most of their investment. The Club's initial masterplan is to offer a repair-guarantee package which users can subscribe to when the six-month warranty on a BBC micro or Electron runs out.

The package can run for as short as one year after the warranty expires or as long as four years. New purchasers of micros, of course, have the option to join the Club at the time of purchase. And for the membership fee, the Club guarantees that should anything break down in the computer it will be repaired at absolutely no cost to the user.

The Club has the backing of one of the world's leading insurance companies and has also negotiated with Computeraid Services, part of the Thorn EMI information technology division, to do the repair work. This means users can go to a local Computeraid Services workshop and having it fixed locally.

The Micro Repair Club is keen to attract schools and will arrange discounts for education establishments.

Cut out the coupon below now and send it to:

ACORN USER SPECIAL OFFER, Micro Repair Club Limited, Swan Court, Mansel Road, Wimbledon, London SW19 4AA

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I would like to join the MICRO REPAIR CLUB for _____ years and look forward to receiving my full membership pack.

I enclose a cheque for:

- £19.95 ☐ 1 year's membership
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Made payable to Micro Repair Club Limited

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I own a ________ home computer and it is in working order.

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ALL PRINTERS HAVE A 12 MONTH GUARANTEE

DOT MATRIX

This month we are adding the new **KAGA** printers to our range of quality dot matrix printers. These printers, with their Epson compatible control codes are available in 80 col & extra wide 156 col versions. Features include NEAR LETTER QUALITY print using a 23 × 18 matrix, Dot addressable graphics in 8, 9 & 16 pin modes. Text modes include Normal, Italic, Enlarged, Condensed, Super & Sub script, Proportional spacing. Defined characters can be placed in ROM to give personalised print. An intergral 3K buffer, both friction & adjustable tractor feeds with built in paper roll holder, etc. etc. makes these superb 'value for money' printers unique.

KP810 (80 cols) **£249 (a)** (with free BBC cable)
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We continue to supply the ever popular, definitive **EPSON** range. This 'industry standard' range provide reliability and quality 'second to none'. The budget RX80FT Dot Matrix, has 100cps and all standard printing and graphic functions as well as friction and tractor feed. The deluxe FX80 has all the above, as well as a 160cps, buffer, programmable characters etc. For wider paper use — up to 15" — the RX/FX100 are ideal.

RX80T **£215 (a)**
RX80FT **£230 (a)**
FX80 **£318 (a)**
RX100 **£345 (a)**
FX100 **£450 (a)**

DAISY WHEEL

The Brother HR15 daisy wheel offers features normally found in printers costing far more. Features include: 14 cps, 3K buffer, proportional spacing, underlining, bold and shadow printing, two colour printing, super & subscript and many other features. Centronics parallel interface is fitted as standard.

BROTHER HR15 **£349 (a)** (With free BBC Cable).

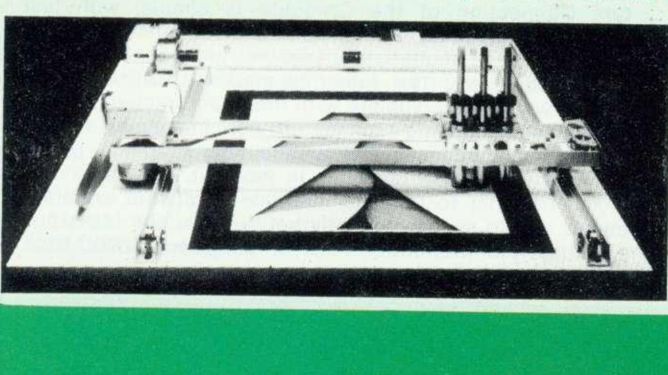
The JUKI 6100 daisywheel with 20 cps, 2K buffer, and switchable 10, 12, 15 cpi + proportional printing. A linear motor ensures optimum reliability.

JUKI 6100 **£345 (a)**

GRAPHICS PLOTTER/WORK STATION

Equally at home in the artists studio, hobbyists workshop, science lab or a classroom, this system has something to offer for everyone. The 3 colour graphics plotter provides both precision and versatility. The carriage can be moved with an accuracy of 0.025cm over an A4 area — the plotter being able to accept paper and far thicker materials at sizes of up to A3. The basic plotter carries 3 colour pens each of which is software selectable. Additional accessories greatly enhance the versatility of the unit without loosing the accuracy. The servo controlled drill/router, and scriber can be used on various materials. A unique Opto Sensor (using a Hewlett Packard device) turns the plotter into a high-res scanning digitiser to read & store whole diagrams and photographs.

Workstation Complete **£490 (a)**;
Basic Plotter **£270 (a)**.
Software on Disc **£3.00**; Opto Sensor **£72**.
Power Supply: PS12V **£42**; PS24V **£78**.
Drill/Router Attachment **£79**; Scriber **£7**.



TECHNOMATIC

All prices exclude VAT

PRINTER ACCESSORIES

EPSON
Paper Roll Holder **£17 (d)** FX80 Tractor Attachment £37 (c).
Interfaces: 8143 RS232 **£28(c)**; 8148 RS232 + 2K **£57(c)**; 8132 Apple II **£60(c)**; 8165 IEEE + Cable **£65(c)**.
Serial & Parallel Interfaces with larger buffers available.
Ribbons: RX/FX/MX80 **£5.00(d)**; RX/FX/MX 100 **£10(d)**;
FX80 Dustcover **£4.50(d)**

KAGA TAXAN: RS 232 Interface + 2K buffer **£85(c)**; Ribbon KP810/910 **£6(d)**

JUKI: RS232 Interface **£65(c)**; Spare Daisy Wheel £14(d); Ribbon **£2.50(d)**
Sheet Feeder **£199(a)**; Tractor Feed Attachment **£99(a)**

BROTHER HR15: Sheet Feeder **£199(a)**; Ribbons Carbon or Nylon **£4.50(a)**

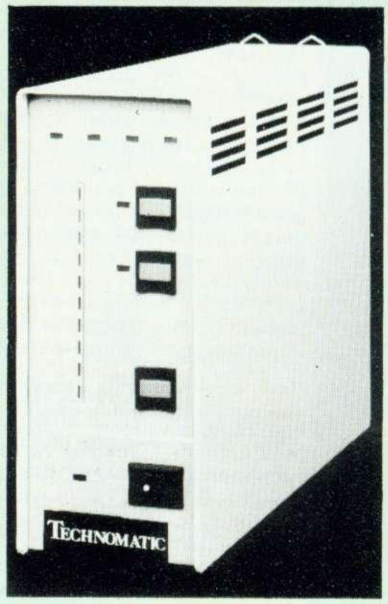
BBC Printer Lead: Parallel (42") **£7(d)**; Serial **£7(d)**
Printer Leads can be supplied to any other length.

Plain Fanfold Paper with extra fine performation (Clean Edge):
2000 9.5" × 11" **£13(b)** 2000 14.5" × 11" **£18.50(b)**
Labels: 2-3/4" × 1.7/16" in quantities of 1000
Single Row: **£5.25/1000 (d)**; Triple Row: **£5.00/1000 (d)**

PRINTER SHARER BUFFER

A unique delux printer buffer/sharer providing a simple way to upgrade your computer system by allowing greater utilisation of existing equipment by reducing the waiting time for printing documents. Data from three computers can be loaded into the buffer which will continue accepting data until its 64K storage is full. The buffer will automatically switch from one computer to the next as soon as that computer has dumped all its data. The computer is then available for other uses. This is a compact unit measuring 7cm × 17cm × 24cm. A LED bargraph indicates the memory usage, with LED indication showing from which computer the data is being fed from. There is simple push button control for PAUSE, RESET, and COPY facilities. The copy facility is ideal for continually printing copies of a document without 'tying up' the computer. Built in mains psu.

SP110 BUFFER/SHARER incl one cable set **£275(b)**



PRINTER SHARER

Three Computers to one printer (parallel)........**£65(b)**
Six Computers to One Printer (parallel)......**£129(b)**
Cables for Three Way Sharer..**£25(c)**
Cables for Six Way Sharer..**£38(c)**

COMPUTER SHARER

Two Printers to one Computer..**£19(c)**

GRAFPAD

A low cost graphic tablet offering the performance & durability required by industrial and educational users. It is compact, accurate & reliable; working area 240 × 192mm + menu area. Comes complete with a CAD packag. **£120** (b).

VIEW PRINTER DRIVER FOR FX80/KP810

This driver allows the use of all FX80s fonts to be used in text written using the VIEW rom. If user defined characters are held in the printer buffer they can also be used within the text. Manual and Disc includes examples of document layout and user definable characters. Supplied on 40 or 80 Track disc.............**£7(d)**

Printer Drivers for NEC PC8023, Brother HR15 and Juki 6100...**£7(d)**

01-208 1177

Please add VAT and carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1.
Carriage (a) sent by Datapost.

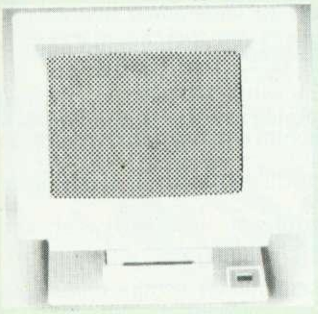
MONITORS

A choice of high quality RGB and Monochrome monitors are available. The British made **MICROVITEC** Std/Med/Hi Resolution 14" monitors offer a consistent reliable performance. Their resolution ranges from 452 pixels horizontal on the std res monitor to 895 pixels on the Hi res monitor. Std and Med res monitors are also available with RGB/PAL/Audio inputs. Dual input versions also available.

1431 Std. Res. RGB **£175** (a); 1431AP RGB/PAL/AUDIO **£225** (a);
1415 Med. Res. RGB **£255**(a);
1451 AP Med. Res RGB/PAL/AUDIO **£280**(a);
1441 Hi-res RGB **£420**(a); 2031 20" Std Res RGB **£260**(a).

The **KAGA** Vision III 12" RGB monitor offers a superb performance but in a smaller cabinet with a genuine etched anti-glare screen. **£358**(a).

The Japanese made **SANYO** and the **KAGA** monochrome monitors provide an ideal answer for an 80 character hi-clarity display. A futuristic swivel base plinth with integral clock is available for the Kaga monochrome monitors as an optional extra.



KX1201G with stand

SANYO DM 8112CX Hi Res Green Screen.......................................**£99** (a)
KAGA KX1201G 20MHz Hi Res Green with etched screen....**£106** (a)
KATA KX1201A 20Mhz Hi Res Amber with etched screen ....**£114**(a)
Swivel Base for Kaga Green (fitted with digital clock)...............**£22.50** (c)
Note: All monitors are supplied with free BBC leads.
BBC Leads: Kaga RGB **£5**; Microvitec **£3.50**; Monochrome **£3.50** (d)

VIDEO DIGITISER

A high quality yet cost-effective unit offering uses for the scientific, educational and home user. Feeding in a video signal (this can be from a camera, VCR etc) will output to the BBC a high quality picture, with eight different grey levels. This picture can be stored on disc, manipulated or dumped to a printer. The friendly, yet sophisticated menu driven software comes complete with an Epson printer dump. **£213**(a).

SANYO DR101 DATA RECORDER

A high quality tape recorder with circuitry specifically designed for recording. Having switch selectable normal/data positions, as well as cue/review and a tape counter, it makes this recorder an ideal choice for anyone wanting a reliable tape storage device. **£30** (c). including free lead. Extra leads **£3.00** (d) Cassette **£3.00** (d).

RH LIGHTPEN

A superior quality lightpen, features including: adjustable sensitivity, LED output to show data transmission, microswitch tip. Full software backup. **£39** (c). The 'Lightpen Colour Graphic Software' pack helps you to draw line drawings as well as more complex drawings. Colour fill, point plotting, line, square, triangle, circle XY rulers are all available with rubber banding facility. **£7** cassette, **£9** Disc. The 'Artfun' pack provides full interaction between pen and screen. Allows your initial design to be shrunk into a high res format, and these images can be stored for subsequent use. **£7** cassette. The 'Word Master' encourages the use of correct grammar and is an excellent aid. **£7** on cassette. The 'Ed Master' uses a quiz format, and up to 160 questions may be programmed by the teacher. **£7** on cassette (d).

RAINBOW LIGHTPEN

Allow your childs creativity to run wild in colour, and develop their artistic potential — allows colour displays to be instantly drawn. Superb software includes facilities of saving and loading screens as well as an Epson screendump. **£10.35** (c).

DISC DRIVES



Technomatic Disc Drives offer the best value for money. They come fitted with high quality slimline Japanese mechanisms & represent the state of art in disc drive technology. They are built to highest standards in design and production, and are all tested to their full performance capability before packaging. All drives are available with or without integral power supply. Dual Drives with PSU are supplied with generously rated integral switched mode power supplies. All 80 track TEAC drives are fitted with 40/80 Track switching at no extra charge to the user. Attractively designed steel casings are painted in hard wearing BBC matching beige paint. All drives can operate in single or double density modes. Drives are supplied complete with necessary cables, manual and formatting disc and are ready to be connected to the computer.

Single Drives
100K 40T SS:TEAC **£100(a)**; TEC with psu **£135(a)**
200K 80T SS: 40/80T TEAC **£155(a)** TEC with psu **£165(a)**
400K 80T DS:40/80T TEAC **£185(a)** Mitsubishi with psu **£195(a)**
3" 100K HITACHI Drive **£115(a)**

Dual Drives
2 × 100K 40T SS with psu: TEAC **£300(a)** TEC without psu **£225(a)**
2 × 200K 80T SS with psu 40/80T TEAC **£375(a)** TEC without psu **£275(a)**
2 × 400K 80T DS with psu 40/80T TEAC **£400(a)**
Mitsubishi without psu **£325(a)**
2 × 400K 80T DS with psu Mitsubishi **£400(a).**

OFFER OFFER

SCOTCH 3M DISCS

Authorised Distributor
Data Recording Products

3M

This month we are offering these high performance discs at a bumper bargain price — not to be repeated again. The current offer will be valid for orders received until 30th October only. These discs are manufactured with advanced manufacturing techniques that have enabled 3M to set the industry standard. Their quality is such that their error free performance is guaranteed for life.
Discs in pack of 10 (c): 40T SSDD **£12.50(c)**; 40T DSDD **£17(c)**; 80T SSDD **£21(c)**; 80T DSDD **£22(c)**

DISC ACCESSORIES

Single Disc Cable **£6** (d) Dual Disc Cable **£8.50** (d)
10 Disc Library Case **£1.90** (d) 30 Disc Case **£8.00** (c)
Lockable Storage Boxes: 30/40 Discs **£14**(c) 100 Discs **£19** (c)

The FLOPPICLENE disc head cleaning kit is the ideal way to ensure the optimum performance of your drives. The use of disposable cleaning discs eliminate the risk of recontamination and abrasion of the sensitive disc heads and ensure continuously reliable data capture and transmission.
Floppiclene with 20 disposable cleaning discs. **£14.50** (b)

COMMUNICATIONS

We offer the customer a choice of modems and suitable communication software, enabling the user to choose an ideal cost-effective system, perfectly suited to his individual needs. We stock modems for every requirement, whether it is for the business, or private user, whether you require access to a public database or a mainframe, whether for local or international use. We also carry suitable software — see our section on ROMS.

MODEMS

TORCH UNICOMM See our section on Torch for further details.

ACORN PRESTEL The dedicated Prestel adaptor complete with integral, BT approved, auto-dial modem and software in ROM **£99(a).**

BUZZ BOX A full spec, BT approved, pocket size, direct connect modem with both originate & answer modes, full & half duplex, allowing access to many databases, bulletin-boards as well as intercomputer communications. It conforms to CCITT V21 300/300 Baud standard. Battery/mains powered. **£65**(c) BBC Lead **£3.50** External PSU **£8.**

B.T. approved

WS2000 A world standard direct connect modem switchable between 75,300/300,600,1200/75,75/1200 baud. It is compatible with Bell 103/113/108, 202 and CCITT V21 & 23 standards and allows you to communicate with virtually any computer system in the world. This is one of the new generation modems, that will probably cover any communications standards you would ever need. This is the modem that will cover Prestel, Micronet, Telecom Gold, Distel, Microweb, One-to-One, Bulletin Boards both in the UK and abroad, etc. etc. as well as user-to-user communication. It also has a rather useful facility of 'Reverse-Prestel' mode i.e. 75/1200 so that you can communicate with other users who only have a standard 1200/75 type modem. What possibly gives this modem its biggest advantage is its option of computer controlled switching between all modes of operation. In addition, separate auto-answer and auto-dial cards are available, giving this modem possibly the greatest potential of all. Mains powered. **£129(c).**



Please phone/write for details of optional extras.

TELEMOD-2 A BT approved modem complying with CCITT V23 1200/75 Duplex & 1200/1200 Half-Duplex standard, that allows communication with Viewdata services e.g. Prestel, Micronet etc., as well as using 1200 Baud for communicating with other computer users. Mains powered. TELEMOD 2 **£65(b)** BBC Lead **£3.50**

TERMI This is a semi intelligent terminal emulator allowing the BBC to act as a dumb terminal, slave BBC graphics terminal, or VT52 terminal. The rates at which data is sent or received is easily set up with rates of up to 4800 Baud with 40/80 col. selectable. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Termi is not suitable for PRESTEL). **£28(d).**

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). **£59(d).**

COMMSTAR This intelligent communication facility is extremely easy to use yet very versatile. It features a terminal mode, a full VT100 emulation mode and a special PRESTEL mode. In Terminal mode, all input may be copied into a buffer in memory over which full control is provided. Controls of protocols is very simple and any type of file (not just ASCII) may be sent using XModem protocols. The Emulation mode may be used using a disc based emulation file to emulate virtually any terminal type including VT100, within the capabilities of the BBC. In PRESTEL mode all normal Prestel features are available, including downloading of software, saving and retrieving of pages etc. etc. **£29(d).**

TECHNOMATIC

All prices exclude VAT

EPROMER II

Our current version of the highly popular Eprom programmer is now being enhanced to provide more and better facilities for easy programming by the user. The software will maintain its superiority over all currently available similar programmers. The range of eproms handled has been widened to include the eproms with lower programming voltage and eproms which can be programmed using the fast algorithm. Control of all operations has been moved to the keyboard. The screen display has been improved to give more information. The screen editing facilities have also been modified to simplify the data entry.

Preliminary Information

* The new Eprom Programmer will now program 2516, 2532, 2564, 2716, 2732, 2764, 27128 and 27256 + 5v eproms, and all but the 27256 in a single pass.
* The programmer will be supplied with integral power supply, and interfaces with the BBC via the 1MHz bus. It is fully buffered and complies with Acorn protocols. There is no power drain from the computer.
* No knobs or switches to fiddle with — total control from the keyboard.
* Fully software driven with easy to understand instructions displayed on the screen.
* Eprom type selectable from the keyboard.
* Selectable programming voltage 25/21/12.5V.
* Defaults to normal programming with high speed algorithmic programming selectable, for a device with suitable capability.
* Continuous screen display of eprom type, option and address range selected.
* Full screen editor with HEX or ASCII input. Constant display of logical eprom address.
* Can read, blank check, program and verify at any address/addresses on the eprom.
* Full Tape/Disc filing facility.
* Several basic programs can be entered on a single eprom and called up with individual name.

£102(b)

ATPL SIDEWISE ROM EXPANSION BOARD

This is a well constructed expansion board that does not require soldering in its installation. It will give you an additional twelve sockets, with 16K of battery-backed RAM option. Several link-selectable options include the choice of type of Eprom, and a 'write protect' for the RAM option. All the busses are full buffered. **£39(d).**

EPROMS 8K 2764-25 **£4.90(d);** 16K 27128-30 **£18.00(d).**
RAM 8K standard power 6264-15 **£26(d);** 8K low power 6264LP-15 **£31(d).**

SMARTMOUTH

The Original 'Infinite Speech' Synthesiser — Still the Best!

A ready-built totally self-contained speech synthesiser unit, attractively packaged with built in speaker, Aux. output socket etc. Optimum sound quality is achieved due to a tailored frequency response audio stage. It allows the creation of any English word with both ease and simplicity, while, at the same time, being very economical in memory usage. You can easily add speech to most existing programs. Due to its remarkable infinite vocabulary, its uses spread throughout the whole spectrum of computer applications — these include educational, industrial, scientific, recreational etc. — simply plugs into the User Port. No ROMs are needed. Smartmouth is supplied with demo and development programs on cassette (easily transferred to disc) and full instructions. **£37(c).**

UV ERASERS

UVT1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. **£59(b).**
UV1 as above but without the timer. **£47(b).**
For Industrail Users, we offer UV140 & UV141 erasers with handling capacity of 14 eproms. UV141 has a built in timer. Both offer full built in safety features UV140 **£61;** UV141 **£79(b).**

'TIME-WARP' REAL-TIME CLOCK CALENDER

A low-cost compact unit that opens up the total range of Real-Time applications, and adds a new dimension to the personal computer. Though built to exacting professional standards, it is at a price previously unattainable, and brings it within reach of all BBC Computer owners. With its full integral battery backup, possibilites include an Electronic Diary, continuous display of 'on-screen' time and date information, automatic document dating, precise timing and control in scientific applications, recreational use in games etc. — its uses are endless and are simply limited by ones imagination. Simply plugs into the User Port — no ROMs needed. Extensive applications software supplied on cassette (easily transferred to disc) and full instruction manual. Please phone for details. **£29(c).**



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Please add VAT and carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1
Carriage (a) sent by Datapost

ACORN IEEE INTERFACE

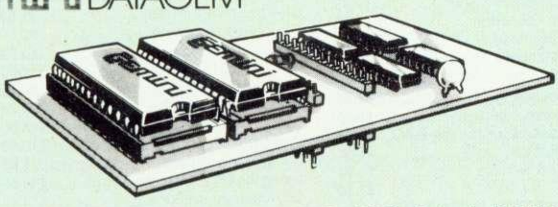
This interface enables a BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard, at a lower price than other systems, but without sacrificing any aspect of the standard. The interface can link up to 14 separate IEEE compatible devices. Typical applications are in experimental work in academic and industrial laboratories, with the advantage of speed, accuracy and repeatability. The interface is mains powered and comes with cables, IEEEFS ROM, and user guide. **£282(a)**

ACORN TELETEXT INTERFACE

This interface enables a BBC Computer to receive and store teletext information transmitted by both BBC and ITV. In addition it allows the downloading of transmitted software. The unit comes with a ROM and user guide. **£195(b)**

DATABASE MANAGEMENT SYSTEM

Gemini DATAGEM



The Definitive Random Access, 24K ROM Based DATABASE MANAGEMENT SYSTEM.
Datagem is the first truly flexible database for the BBC Micro that can make your system really useful and efficient, saving you money in the long run. The system includes a carrier board containing two Eproms, demonstration applications disc in both 40/80T, professional documentation with quick reference card, and 'Trans' utility program. Features include: *almost unlimited file size (max 10MByte) *supports up to 4 drives *Max of 5000 records per file *max 6K record size *max of 62 fields *9 level hierarchical search system with facilities to store results of searches. Searches can be any one of the following: Search, Include, Exclude, Combine, Common or Difference *user defined variables *generates form letters from records. Please ask for leaflet. **£112(c).**

ACORNSOFT/MIRLE
Business software

A well designed, cost effective business system, having the advantage of being able to purchase packages individually, with the option of, possibly later, linking them with other packages. INVOICING, ORDER PROCESSING, ACCOUNTS RECEIVABLE, ACCOUNTS PAYABLE, STOCK CONTROL, PURCHASING, MAILING SYSTEM. **£22(d) each.**

SPECIAL CLEARANCE OFFER

Hell Driver; Felix in the Factory; Laser Command; Martian Attack; Cybertron Mission; Alien Destroyers; Chess; Escape from Moon Base Alpha; Swoop; Alien Swirl; Demon Decorator; Android Attack; Danger UXB; Footer; Moon Raider; ZARM; Eldorado Gold; Galactic Commander; Where?; Labyrinth of La Coshe: Chemistry; Physics; Constellation Croaker.

Only £2.50(d) each

BBC FIRMWARE

VIEW Word Processor Rom on special offer at **£48(c).**
This is the new version V2.1. Advantages include being able to print straight from memory, as well as editing in any mode. Complete with comprehensive manuals to Acorns usual high standard.

WORDWISE One of the most popular word processors for general use **£34(d).** Wordwise SpellCheck Disc — A must for any serious word processor user. Normal price **£16.50(d).** If bought with Wordwise: No p&p and only **£14.**

ULTRACALC From BBC Publications: The only spreadsheet ROM for the BBC that offers features found in the most sophisticated spreadsheet programs, like the handling of labels as well as numbers as values, and allowing a search by a meaningfull name instead of just a number etc. Efficient memory usage allows large spread sheets to be constructed. Facilities and commands include, variable width column, Sum, Replicate, Insert, Delete, & most mathematical functions. It helps to create and manipulate pricelists, balance sheets, payroll, c/flow forecasts, order entry, small databases, scientific calculations. **£69(c).**

VIEWSHEET Ask for details **£52(c)**

BCPL A full implementation of the BCPL compiler language from Acornsoft. It consists of the BCPL language ROM and a disc containing the BCPL Compiler, a Screen Editor, a 6502 Assembler, other utilities and program development aids, and some examples of BCPL code. A comprehensive 450 page user guide is included. It can be used to develop games programs and commerical packages, to develop system software, to write control systems, and to produce programs which otherwise would need to be written in assembler. **£86(b).**
BCPL CALCULATIONS PACKAGE: supplied on disc, it supports floating point, fixed point and fast integer calculations. It includes the BCPL calculation files, example files and a comprehensive user guide. **£17.30(b).**

UTILITY ROMS

DISC DOCTOR This general purpose ROM adds 20 commands to the DFS system. It includes a formatter, sector editor, tape-disc & disc-tape routines, a powerful disassembler, commands for listing function key definitions for editing etc. This ROM will obliviate the need to go for non standard DFS systems (with their inherent disadvantages) as it overcomes many of the Acorn DFS's shortcomings. **£28(d).**

GREMLIN Contains a full machine code monitor including features such as a dissassembler, memory move and search routines. Also feature a full expression evaluator and an assembler. Can single step through ROM & RAM as well as any sideways ROM. Works in any mode with full status display. Up to 8 breakpoints can be used and it has a special mode for debugging graphic programs. **£28(d).**

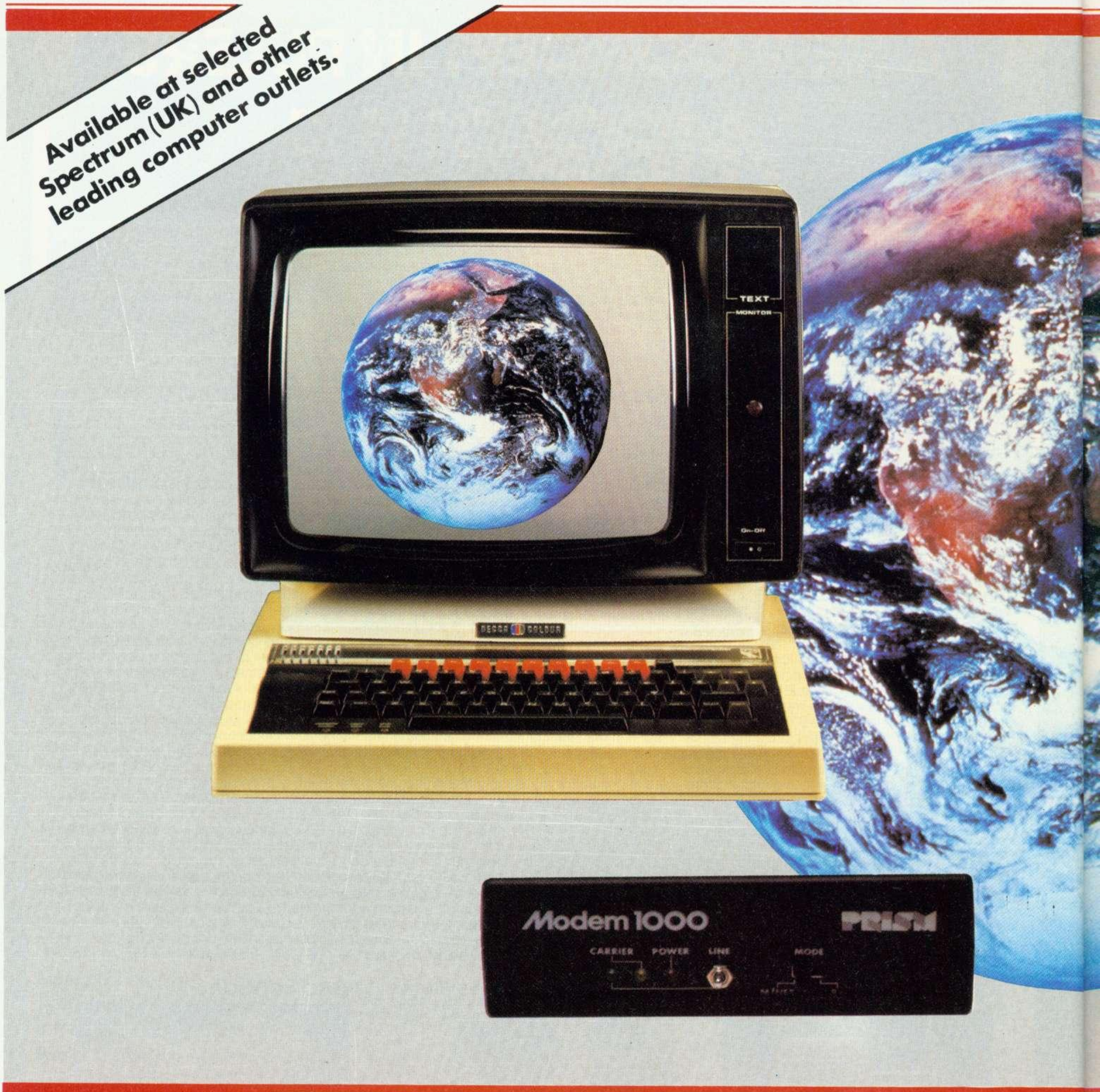
EXMON This extended machine code editor provides 35 new commands. Features include machine code relocator, single stepping, memory search and full assembler & dissassembler. **£20(d).**

TOOLKIT This ROM adds 27 new commands to the BBC BASIC. These include a full screen editor, merge, relocating data in memory, program compactor, listing of variables and memory search. **£23(d).**

CARETAKER This adds 17 new commands to the BASIC which include: renumber, squash, exchange insert, single key entry of BASIC keywords etc. **£28(d).**

GRAPHICS ROM This ROM includes over 28 new graphics related commands which can be used in BASIC programs. Features include: sprites, LOGO Turtle graphics, fill routines, shading, large characters, rotation, scaling and 3D plotting all using '*' commands. **£28(d).**

PRINTMASTER This ROM features the most versatile screen dump for EPSON MX/RX/FX80 and Kaga 810 printers. It supports three types of dumps. The first allows any graphics on the screen to be dumped. Colours appear as shades of grey. Any part of the screen can be printed at any position on the paper in any one of four orientations. The screen dump may be magnified by any factor ×2, ×3, ×4 etc. A special feature allows true MODE 7 screen dumps with TELETEXT text & graphics. The second dump allows any text to be dumped whilst the third dump will print the contents of a file on disc whilst the computer is doing other things. This is not all. All printer functions can be called up using the *command. *DEFINE allows the user to define his own characters and store them. *GPRINT allows printing of enlarged text in any position, orientation, size & shade. *WINDOW allows windows to be defined in any size and position on the screen. **In short this one ROM does it all. £28(d).**



MAKE THE BBC AN EXPERT AT COMMUNICATIONS.

ELECTRONIC *Graffiti*

BBC TV producer David Allen shares some of the behind-the-scenes traumas of making live micro programmes

Put another password in.
Bomb it out and try again,
Try to get past logging in.
We're hacking, hacking, hacking.

Try his first wife's maiden name.
This is more than just a game.
It's real fun, but just the same
We're hacking, hacking, hacking.

THE Hacker's Song became instant news in the first *Micro Live* back in October as it flashed unheralded onto the screens of those watching BBC1 when John Coll and Ian McNaught-Davis attempted to demonstrate electronic mail live on television.

Someone had cracked our (two-letter) password and left a message that was triggered off as John logged on to British Telecom Gold. A hacker, in fact.

The term hacker comes from American university campus slang, where it originally meant simply someone who worked hard: 'Who are you hacking for?' – 'Oh, Doctor So-and-so'. But we now know it to mean someone who tries (as a hobby) to break into other people's computer systems.

In the gallery above the studio we were bemused – it was the first time we had been on the receiving end of a hacker, and although there had been rumours that something might happen, the production team were not involved in what actually took place. The whole incident was like someone bursting into the nine o'clock news and shouting out a political slogan.

I can't remember anything like it having happened on television before. What I can remember is furiously scanning the screen for obscenities (it was live, after all, and on a Sunday morning) and being relieved at the exquisite taste of the practical joke. Like all good practical jokes it was not malicious. It also was instructive. 'Try his first wife's maiden name' is after all, a sobering comment. At that time, the password on my electronic mailbox was indeed my wife's maiden name! I changed it afterwards to the name of my cat.



'Micro Live' presenter Ian McNaught-Davis meets Freff in New York. Using a BBC micro, Freff transmitted an illustrated message from the 'Big Apple' to London for the show .

As the hacker (or hackers) was anonymous, it wasn't possible for us to acknowledge copyright in the work. However, I am happy now to be able to put that right. Our hacker's song was part of a longer epic quoted in *Newsweek* by an American hacker called 'Ozzy' (not to be confused with one half of Oz and Yug, whose express mail message appeared at the bottom of the screen alongside the hacker's song and whom we incorrectly assumed were responsible for it all). Ozzy says the proper credit should go to someone enigmatically called 'The Cheshire Catalyst'.

Another stanza goes:

Syscall, let's try a syscall.
Remember that great bug from
Version 3
Of R-S-X, it's here,
whoopee!

Put another Syscall in,
Run those passwords out, and then
Dial back up, we're logging in
We're hacking, hacking, hacking.

(To be sung to the tune of *Put another Nickel in the Nickelodeon'*.)

Newsweek, it seems, were as bemused as I am by much of this. Perhaps some friendly hacker can inform me of its meaning.

Electronic mail and hacking were the subject of another item on June 24 when we transmitted the second *Micro Live*, again on a Sunday morning.

This time we investigated the world of the computer hackers by filming one hacker, 'David', in silhouette, actually in the act of getting into a system, and another, 'Jeremy', a reformed hacker, who was prepared to reveal some of the secrets of the fraternity.

Another item involved a live transfer of software from New York to London by Freff (that's his full name, by the way), our reporter in the United States. And that demonstration, carefully supervised by Telecom Gold to prevent another intrusion, very nearly precipitated another 'hack' as a result of the very measures we were using to prevent history repeating itself. But more of that later.

Freff first appeared in our consciousness when we visited the Chicago Robotics Convention in 1983 for the series *Computers in Control*. He was behind the scenes of a stage show that

featured several Unimation robots and an actor. Freff was supervising the network of micros that triggered off the sequence of events in which the robots worked co-operatively to entertain the crowds.

Later, having just attended the launch of the BBC micro in America, I visited him in New York in the apartment where a good deal of work for the robotics show was put together. It became clear that his interests in the microcomputer covered so many fields that he would make a great transatlantic contribution to *Micro Live* and the new series we are working on for this autumn.

Last October Acorn (USA) promised to provide him with a BBC micro to review and, sure enough, it arrived in May just two hours before I arrived in New York to work out a film story with Freff for *Micro Live*.

We've been using electronic mail in the BBC Computer Project for over a year now, and very useful it is, too. British Telecom Gold had, forgivingly, provided me with a series of links so that while in the US I could enter the Dialcom system in the US to make contact with my mailbox in London. Usually I use a portable Tandy TRS80-100 when I go abroad, but Freff and I decided to use the BBC micro, fresh from its box.

Needless to say, when we pieced everything together the electronic mail system didn't function, even though the computer seemed to be working well. Knowing how infuriating this experience is to users, we made a virtue of it and I filmed Freff in a frustrated state, saying that he didn't know what was wrong, but something sure was, and that he hoped to get it all functioning before the live show.

Since we'd seen electronic mail working on the first live show we decided to try something different. We'd have Freff on the telephone talking to us and, using a second telephone line connected to the micro, he'd send us a piece of software that we'd then run in the studio.

An attractive and simple enough idea. However, over the weeks between his getting the machine (and replacing the faulty modem) and the live show itself we discovered that things weren't quite that simple.

First, the US version of the BBC micro has a different operating system and a slightly different Basic to suit the American market. American television monitors run at 60 cycles and have 525 lines instead of 625 as in the UK. This means that the screen formatting is different. And the Americans, of course, have differences in spelling – the COLOUR command, for example, becomes COLOR. And if you abbreviate a line of code to COL the machines print out the whole thing as COLOR on one version and COLOUR on the other, when you list the program, even though both machines accept the abbreviation.

Second, the electronic mail system doesn't have error-checking, so everything depends on a good telephone circuit, and occasionally, especially if everything was going through the BBC switchboard, odd characters would disappear or get garbled.

Thirdly, you have to write the code so that there are reasonably short lines, otherwise the mail system splits them. If it happens to split them so that the new line begins with a number, the computer thinks this is a new line number and everything gets confused.

However, we eventually devised a piece of software that would run reasonably well on both machines – a representation of an apple, with a message. On pressing the space bar, three bite-shaped chunks appeared out of the apple, together with a crunching noise, with the message 'Some bytes from the Big Apple'. Core-ny? Well, we were only doing it for fun, though in principle this is a perfectly reasonable way of shipping a computer program around the world.

When it came to the day, we had devised a way of getting the mail sent quickly. Freff was to load the program up from disc as an ASCII file into the mail system and was poised to type the commands (which sends the mail) . . .

Meanwhile, partly spurred by the first *Micro Live*, Telecom Gold introduced procedures to prevent or at least discourage hacking. After three attempts at a password you are now thrown off the system, and repeated attempts to log on are monitored, so they tell us. And passwords now have to be at least six characters long.

Nonetheless, understandably anxious to avoid a repetition of last year's hacking, Telecom Gold said it would issue new mailboxes and new passwords only an hour or so before the show, and these were to be communicated to Freff by direct phone and to John Coll on the studio floor.

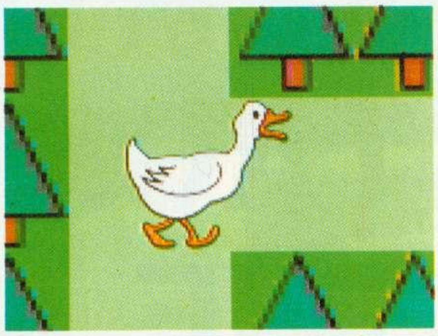
Sure enough, in the middle of the studio rehearsal on the day, a representative arrived and whispered the new password and mailbox to John as he spoke to Freff on the phone. Unknown to any of us, John Coll's personal microphone, clipped to his tie, was picking up every intimate detail and the studio sound was being relayed not only to the gallery, but also to the dressing rooms and, more significantly, to the conference room in which members of the invited audience were having coffee and twiddling their thumbs. One or two of them were, shall we say, not unconnected with hacking and had brought personal micros with them (largely I suspect because they don't like being separated too long from the computing drug).

I am told that a number of them jumped several feet in the air at being handed the information on a plate, and rushed for the telephone. Fortunately for Telecom Gold and for Freff's demonstration, they were foiled by BBC policy – which prevents outside lines being obtained from conference rooms! And rather than miss the show, they resisted the temptation to rush out from the Television Centre to find a call box.

If you were watching the programme, you'll know that Freff's demonstration worked well, with only one error, and one we expected – a syntax error resulting from the keyword COLOR, which John corrected. Unfortunately the sound of the crunching apple failed to materialise on air because someone had pulled the jack plug out of the back of the machine by mistake. So, for the record, here's the noise you missed:

```
1300 SOUND 0,-15,6,1
1310 SOUND 0,-15,4,1
1320 SOUND 0,-15,5,2
1330 SOUND 0,-15,4,1
1340 SOUND 0,0,4,4
1350 FOR times = 0 TO 15
1360 SOUND 0,-15+times,4,0
1370 SOUND 0,0,4,3
1380 NEXT
```

BIRD OF PREY GAME OUT FOR A DUCK



CAN this little duck really be the bird referred to in the title of BBC1's recent *Bird of Prey* series? We don't know, but it's a shame the computer game to accompany the programme never made it (see Bulletin Board, page 16). If you think the graphics in the credits were produced on a humble micro though, think again. The pictures were 'pixellated' to give the jagged-edge effect of low-resolution computer graphics on a Quantel Paintbox. And how much is one of those? A cool £80,000.

VERTICAL TACK OF THE ABC

by Tony Quinn and Alex van Someren

AT THE FIRST public airing of the ABC range during the PCW Show, a development manager from Apple is reputed to have challenged staff on the Acorn stand about who had written the icon-based desk-top manager software – because it was so similar to Apple's own version for the Macintosh and they might want to sue! Apocryphal or not, the story reflects the concern which the arrival of the ABC must have stirred up in the competitive business computer market.

Acorn has repackaged its existing BBC micro-based products in an attractive new enclosure, and at the same time launched a range of hardware and software extensions which will give even the biggest commercial computer suppliers a few second thoughts. The ABC will be available in eight different models (see table below) providing a structured upgrade path within one chunky monitor housing which should cater for a wide variety of business needs.

All of the range use a 6502 processor for input/output (to control the screen, keyboard and disc drives); the larger models also have second processors to allow them to run more sophisticated operating systems than Acorn's MOS. At the low end is the Personal Assistant, with View and View Sheet as standard. And there's the Terminal, providing emulation for the DEC VT100 terminal for use with modems or the Econet. Neither of these machines has second processors as they run MOS-based software.

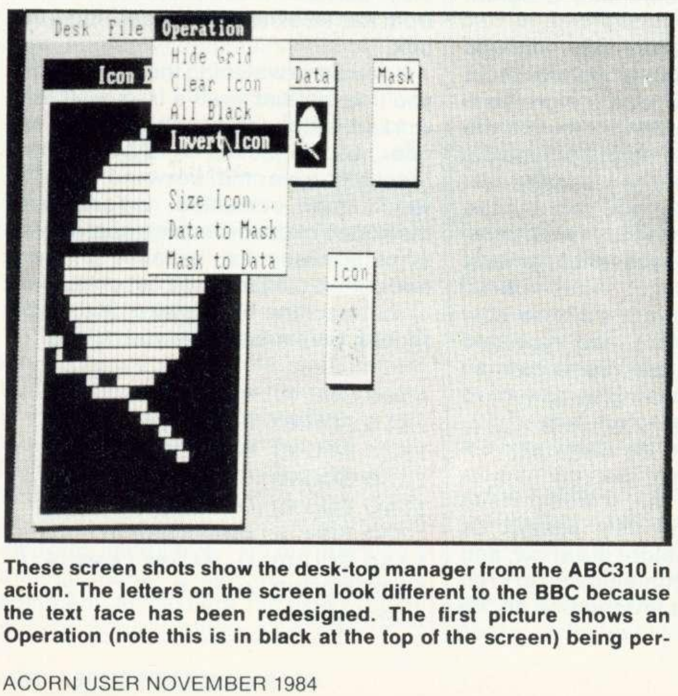
The ABC100 and 110 are Z80-based machines running CP/M and were recognised as such at the PCW Show. Commented one visitor: 'If they had released the ABC100 on its own, no-one would have taken much notice – it's hardly revolutionary stuff.' But the top-end 310 has been noticed, and excited many potential buyers.

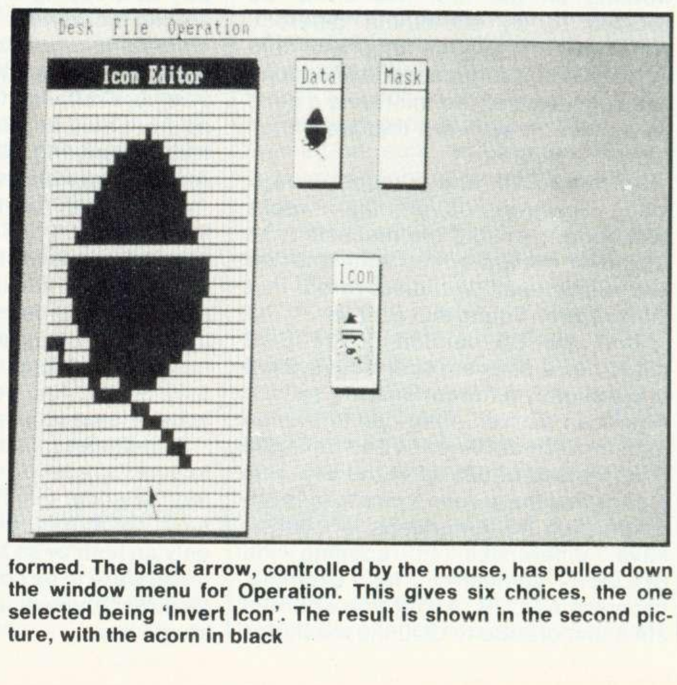
The 300 series uses the Intel 80286 processor and is an impressive machine to sit down at. It is compatible with the IBM PC but can provide more advanced processing power with its Concurrent OS and Desktop Manager. It is sure to give IBM's new PC-AT a run for its money (it uses the same processor), and Acorn's Hermann Hauser has been quick to point out that the product was developed in far less time than IBM who had early access to the chip, while carefully integrating it into their range. The ABC310 offers icons, multi-tasking, windows, CP/M, MS-DOS, and PC-DOS. 'The ABC', says Hauser, 'is the only machine to do this.'

However, Acorn is keeping a low profile on any IBM clash and letting the industry do the talking. The company's first brochure for the ABC range doesn't even mention IBM. The nearest it gets is 'PC-DOS'. Sales Director Peter O'Keefe put it succinctly: 'We are a little smarter than to take IBM head-on. We're going for vertical markets in research, communications and so on,

Table 1. The ABC range

Model:	PA	Terminal	100	110	200	210	300	310
Processor:	6502	6502	Z80	Z80	32016	32016	80286	80286
Floppy disc:	640K	—	2x720K	720K	2x720K	720K	2x720K	720K
Hard disc:	—	—	—	10Mb	—	10Mb	—	10Mb
Screen:	Green	Colour	Green	Colour	Green	Colour	Green	Colour
Software:	View Sheet	VT100	CP/M	CP/M	Various, Xenix		CP/M, MS-DOS, PC-DOS	





These screen shots show the desk-top manager from the ABC310 in action. The letters on the screen look different to the BBC because the text face has been redesigned. The first picture shows an Operation (note this is in black at the top of the screen) being performed. The black arrow, controlled by the mouse, has pulled down the window menu for Operation. This gives six choices, the one selected being 'Invert Icon'. The result is shown in the second picture, with the acorn in black

where we are established.' He also pointed out at the recent company results meeting: 'IBM are good customers of ours.' At which Chris Curry chipped in: 'But we don't buy any of theirs.'

The Xenix operating system is promised on the ABC210, along with up to 1Mb of RAM. Virtually every language under the sun has been mentioned, from the latest, Modula-2 (see *Byte*, August issue) to Fortran 77 for the die-hards. The 32016-based ABC200 machines are being pushed as academic workstations, and, sure enough, were running Lisp, the artificial intelligence language, at the Show.

The flagship ABC310 certainly lives up to its promise, for it has been demonstrated running a sophisticated, mouse-controlled desk-top manager with icons, menus and windows. For those of you who are baffled by such jargon, it provides a software simulation of a desk complete with overlapping sheets of paper (windows), disc storage (shown as pictures that are known as icons) and possible things to do (presented in menus).

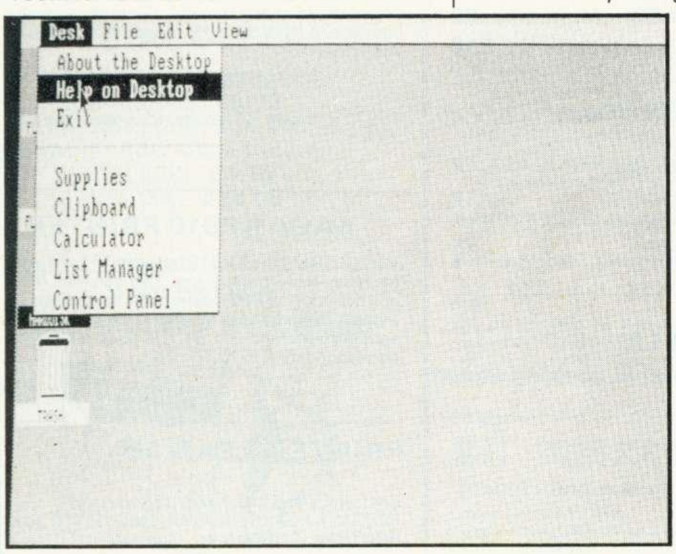
The success of the machine, as with any business computer, will depend to a large extent on the amount of applications software written for it. On this front Acorn has certainly hedged its bets with all the popular operating systems available, and response at PCW was good, said Howard Fisher who is responsible for the ABCs.

How will it find its place in the market, and especially when it comes up against the IBM PC-AT? Who knows, but on first showing its chances are good and pricing (so far guessed at £500-£3500), should be competitive. And, as Peter O'Keefe says: 'There's room for IBM as well as Acorn.'

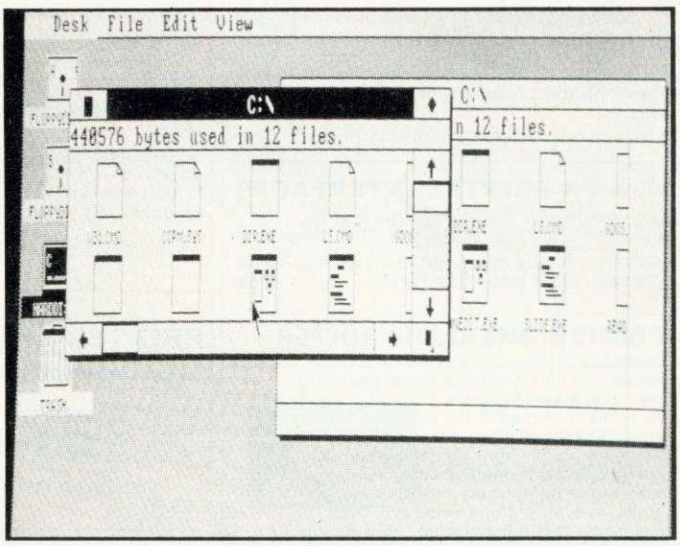


A marvel on marble: the ABC310 in all its glory. Beneath the monitor screen on the left is the Winchester hard disc, with the floppy drive beside it. Note the new symbols on the keyboard, re-arranged function keys, keypad and the mouse. There is no break key, but a reset is fitted on the rear of the keyboard. The monitor can be tilted and swivelled on its stand

Additional reporting by Geoff Nairn



In this shot, the menu for 'Desk' has been accessed with the black arrow cursor pointing to 'Help'. Underneath this menu window are the standard icons to choose the floppy drive (sides A or B), hard disc or 'trash can' (very American!)



The hard disc has been accessed here (hence the icon in black on the background) to display file C: \ which is 43.5k long. Two windows showing parts of the 12 files in C: \ are shown

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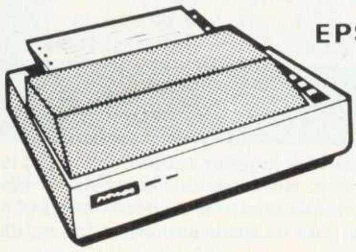
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- Centronics PRINTER CABLE for all the above printers to interface with the BBC Micro £7

(Securicor carriage charge on printers £7)

RX & FX PRINTER INTERFACES
Epson interfaces fit inside the printer to allow connection using techniques other than Centronics.

RS232	£35	RS232 + 2K Buffer	£59
IEEE 488	£65	2K Parallel	£58

PRINTER INTERFACE BUFFER
This neatly packaged, self-contained unit is supplied complete with all leads, operating manual and power supply. Computer output to the printer is stored in the buffer so that the computer can continue with other tasks while the printer works from the stored contents in the buffer. 16K holds approximately 10 pages of A4, close to the full memory of Wordwise. The 48K model is very useful for extremely large documents that otherwise tie the computer up for hours while being printed.

Price: 16K	£115
Price: 48K	£149

Type	Ribbons	Dust Covers
MX80FT	£4.75	£4.50
MX100/FX100	£10.00	£5.25
FX80	£4.75	£4.95
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GP80	£4.50	–
GP100	£4.95	£3.95
GP250	£5.95	£3.95
GP700	£18.50	
KAGA KP810	£5.95	£4.75
CANON PW1080	£5.95	£4.75

PRINTER SHARER
This handy UNIT is a solid state switch system designed to ease the problems of short printer leads, continual plugging and unplugging of leads, and costly extra printers by allowing up to three computers to be connected to one printer. It has four parallel Centronics connectors for easy interfacing of the BBC micro to any printer with a Centronics capability such as daisy wheel, dot matrix or plotter type printers.
PRINTSHARER is ideal for schools and colleges for sharing their printing resources.

Price: **£65** (£2 Carr.)

BROTHER HR-15
DAISY-WHEEL PRINTER

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This new Japanese printer has EPSON FX/RX compatible control codes and is functionally equivalent to an FX80 with the added advantage of its 'Near Letter Quality' mode. It is solidly built and features include: Normal, Italic, Enlarged, super/subscript, proportional spacing and user-defined character set. Extras over the FX80 included in the price are Near Letter Quality (NLQ) print ideal for correspondence, properadjustible tractor feed, half speed quiet mode and 3K buffer. The printer is bi-directional and logic seeking to give a speed of 140CPS for high throughput in conjunction with the standard 3K buffer. 8K RAM may be added to give more user-defined character sets. Centronics parallel interface + Watford's 12 month NO QUIBBLE WARRANTY.

Special Offer: ONLY **£246**

RS232 interface + 2K buffer to connect to other micros **£89**

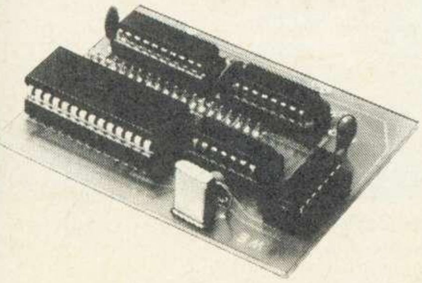
KAGA KP910 PRINTER
Very similar to the KP810 but with 17" carriage for really wide print. Gives 156 columns of normal print or 256 columns in condensed mode. This printer is ideal for printing out spreadsheets and can also be used for correspondence in NLQ mode.

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- Discs may be created in either single or double density format with the built in formatter and in single density mode are fully compatible with normal Acorn format discs.
- The density of the disc you put in is automatically sensed by the system and you are informed of the density in the catalogue display.
- The double density system is of course faster than single density.

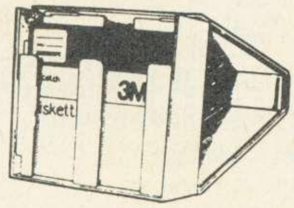
Worried about compatibility with single density discs? Don't. The Watford Electronics DDFS implements an extremely comprehensive 8271 emulator so that commands passed through OSWORD &7F are correctly interpreted. Other manufacturers thought that read and write sector alone were sufficient – we decided to implement every command of the 8271 that was physically possible. We have allowed the use of all the special registers including bad tracks, allowed access to deleted data etc., etc. The emulator itself takes up around 1K of compactly written machine code. We reckon it will run the vast majority of protected discs now available.
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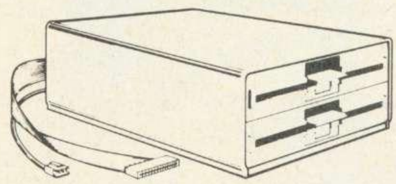


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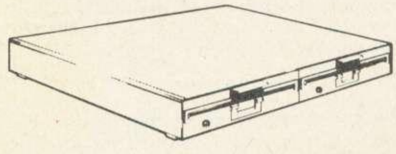
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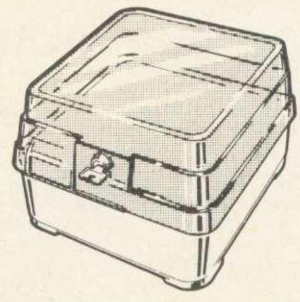
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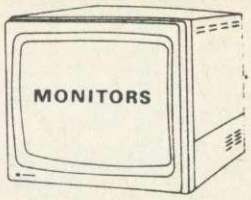
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BBC Model B, Watford Electronics' DFS upgrade, WORDWISE ROM, Twin 200k Teac drives in beige, Zenith 12" Hi-resolution monitor (Green or Amber), Brother HR15 daisywheel printer. Gemini software: BEEBCALC spreadsheet, analysis and DATABASE software on disc. 10 × 3M discs, 500 sheets fan-fold paper, 4 way mains trailing socket, manuals, all leads and BBC carrying case.

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RGB lead for KAGA ... **£5**

N.B. Carriage on Monitors **£7** (securicor)

Versatile **BEEB SPEECH SYNTHESISER** Unit



SIMPLY the best! – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!
PHONEMES for word synthesis – That means unlimited vocabulary! No extra speech dictionary chips to buy!
BUILT-in Library of approximately 500 words to get you started.
ENGLISH accent – Utilises inflexion techniques to produce highly comprehensible speech.
EASY to use system – Just plug the software ROM into a socket, the Speech unit into the User Port, and away you go! No specialised 'dealer upgrade' required!
COMPACT unit – The whole system is built into a small case – easily tucked behind the computer. Auxillary output socket provided for direct connection to an external amplifier.
HOURS of fun! – Suitable for any application – Games, Educational Programs, Specialised Packages.

We know this all seems to good to be true but DON'T BE LEFT SPEECHLESS! Order your Versatile Speech Unit now!

Only £44

Best cost less at WATFORD

WATFORD'S LAUNCH OF THE YEAR

APEX

The ultimate expansion system for the BBC microcomputer. It enables you to increase memory capacity to 2+ MEGABYTES including BATTERY BACKED-UP RAM.

The system consists of a mother board which fits inside the BBC and further daughter cards can be connected externally. The internal card has the following features:

- 15 ROM/RAM sockets, 11 of which can be configured as 2716, 2732, 2764, 27128 EPROMS or ROM equivalent devices or as 6264 RAMs. Any RAM is Automatically battery backed-up and it's contents preserved when the power is turned off.
- The battery is recharged every time the machine is turned on and lasts several months, depending on the number of RAMs fitted.
- There is very little extra current drain, even with a fully loaded board as only the presently active ROM is powered up. In fact the fully populated board uses only 300mA.
- The board reduces micro bus loading by up to three ROM loads, which improves reliability and performance.
- Installation is extremely simple. There is no soldering required. The board is rigidly held by two 40 pin sockets and five support posts. A ribbon cable can be brought outside the computer and up to 8 external cards added. This enables the user to plug-in up to 142 paged ROMs. The cards have following features:
- Each card can accommodate up to 16 devices each of which can be configured as 2716, 2732, 2764, 27128 ROMs or 6264 8K RAMs.
- Battery backup is provided from the internal card.
- Only the active ROM is powered up permitting many external ROMs to be added with very little current loading (100mA per card).

The system comes with controlling software in ROM. The utilities supplied are as follows:

★ APEX – replies with the device number currently being accessed.

★ APEX C – toggles between the colour and standard black and white messages.

★ AL – loads from any device, regardless of the data type.

★ AS – saves memory to any specified RAM device.

★ AD – prints a directory of the devices present in the system, i.e. ROMs present and files stored. This also reports on the amount of free storage space.

★ AF – asks for the free RAM devices.

★ LA – repeats the last command to paged ROMs.

Continued

★ AT – enters a memory testing routine. This will write a test pattern into the memory and read it back out again. If a fault is found, it is reported to the user. This test continues until Escape is pressed.

- RDISC – activates APEX as a filing system which then treats all free APEX RAM in the system as a continuous 'RAM-DISC'. All commands have similar format to the DFS and transfer is possible between the two systems.

The complete computer system bus is available to the user, so that other cards/devices could be added such as EPROM programmers, second processors, Winchester disc drives, clocks, etc. By racking the cards you eliminate the tangled mass of cables that usually accumulates around the micro.
A comprehensive operating manual is supplied with every APEX Board. Please write in for further details and prices.

THE ULTIMATE DFS FOR BBC MICRO

by

Watford Electronics

Highly acclaimed at The ACORN and BBC MICRO USER Shows. What do the independent press say?

Good value for money – *Beebug Aug. '83*

A very worthwhile package – *The Micro User*

You'll be buying a very powerful package – *Personal Computer News*

Superior DFS; Excellent disc sector editor – *Computer Answers*

Without a doubt, the most sophisticated DFS Software yet written for BBC Micro Computer. This powerful new DFS is fully compatible with ACORN DFS yet has much increased power due to additions, carefully designed to make life easier in normal use. It consists of over 14K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

Please write in for full technical specification.

PRICES:
DFS (Disc Filing System) ROM **£25**

Complete Disc Interface Kit including DFS ROM & Fitting instructions £99

Disc Filing System Manual. Comprehensive and clearly written £7.50 (no VAT)

P.S. We will exchange your existing ACORN DFS or PACE (AMCOM) DFS for Watford's highly sophisticated 16K DFS ROM for **£19**

Watford's DFS is exclusively available from Watford Electronics. We do NOT retail through any dealers. Every ROM carries a label with our LOGO and a serial number.

Now available:
Acorn DFS Kit ... **£99**

EPROMs & CMOS RAMs

NEW LOW PRICES

2764-250nS (8K ROM)	**£5.25**
27128-250nS (16K ROM)	**£19**
6116-150nS (2K RAM Low Power)	**£5.25**
6264-150nS (8K RAM Low Power)	**£28**

BEEB PRINTER ROM



"Makes Printing Childs Play"

This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:

★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.

★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.

★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.

★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.

★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.

★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.

Price: £24

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting facilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any Mode (including Mode 8). There are various optional parameters but you need only specify the parameters you wish to change.

● V <scale>, H <scale> – These 2 byte numers give fine control over the size of the dump from minute to enormous. Unlike other dump ROMs the scale does not change with mode.
● R <0-3> – Print dump rotated by 0.90, 180, 270 degrees.
● I <indent> – Set gap from left edge of paper.
● X <min>,<max>, Y <min>,<max> – The whole of the screen graphics window area is dumped except when these parameters are given.
● P – Physical colour values are used for plotting, otherwise a negative scale is used (white darkest).
● T Two tone dump for maximum resolution.
● M <mask> – 8 bit colour mask.
● E – Contrast expansion to make mode 7 text and separated graphics stand out from the background.
● C – All mode 7 graphics are printed as contiguous to improve the shading in graphic areas.

*TIMAGE <indent> – Does a fast, text only, dump of the contents of the text window in any mode.
*GWINDOW and *TWINDOW – These commands draw the graphics and text windows, respectively, on the screen and allow them to be changed with the cursor keys. N.B. GIMAGE and GWINDOW work fully in mode 7.
Designed for use with the following printers: CP80, GP80, GP100, GP250, STAR, KAGA/TAXAN, NEC, SHINWA, GEMINI, EPSON MX/RX/FX,LPVII, DMP 100/120/200/400, CANON.

Price including comprehensive manual **£22**

APPROVED for use with teleco[illegible]n systems run by Briti[illegible]munications in accorda[illegible]e conditions in the ins[illegible]s for use.

MODEM 84

PRESTEL TERMINAL

For the BBC Microcomputer



The Watford Prestel package allows B.T. approved connection to Prestel, Micronet and many other 1200/75 baud databases for about the cost of a good tape recorder.
Prestel gives you access to an incomparable database covering almost every subject under the sun. There is Micronet with lots of free programs that you can download and run. Details of clubs and user groups, a diary of meetings and exhibitions, news and reviews, technical information etc. There is Homelink with online banking. And there is armchair shopping, travel information, entertainment, world news, sports news, weather information, electronic mail and lots more.
The basic Prestel subscription is only £5 per quarter and at off peak times there is no charge for access time. A local phone call facility means no long distance phone calls to Prestel (approx. phone cost is only 40p per hour).
The Watford Prestel package consists of the B.T. approved Watford MODEM 84 (1200/75 baud full duplex 1200 baud half duplex direct connect) and a very sophisticated Prestel Terminal ROM.
This totally machine code software:

● is fully compatible with not only the Modem 84 but also with the PRISM 1000 and most other modems that require a data link via an RS423/RS232 port making it a worthwhile purchase for those who already have Modems.
● supports full Prestel colour alpha and graphic characters including double height, flashing, conceal/reveal.
● called by simple *PRESTEL (*P.) command. Disc and tape configurations fully supported.
● includes a comprehensive telesoftware downloader for BBC and other programs with continuous on screen status report (an essential facility).
● has very powerful OFF LINE MAILBOX editor allowing colour flashing graphic mailboxes to be prepared without having to be on line to Prestel.
● auto logon sequence can be burnt into ROM if desired.
● a vital 'TAG' facility allows tagging and recall of interesting pages, avoids that common and annoying 'NOW WHERE WAS THAT PAGE' problem.
● includes simple page and program loading and saving functions for both disc and tape, automatically assigning frame and program directories.
● not one but TWO PRINTER DUMP ROUTINES are provided within the software allowing either full graphics dump (mode 7 to EPSON compatible printers) or ASCII characters only.
● a user function built into the software allows interface with specialist routines, (yours as well as ours).

EPSON DUMP ROM

This screen dump ROM is specifically designed for use with the Epson RX/FX printers and the Kaga KP810. It is extremely simple to use as there is only one command to remember. It will accurately dump any screen mode using multiple tones as required. Mode 7 is fully supported giving teletext graphics, double height etc. For those who like to keep life simple this EPROM is only **£20.**

FORTH ROM for BBC

This ROM provides a complete implementation of the FIG-FORTH standard (including editor). Supplied with a large tutorial manual at only **£33**

TINY PASCAL for BBC Micro £59

● All the above facilities are accessed via function keys. An overlay is provided to give comprehensive guidance to key functions.
● A 34 page comprehensive instruction/operating manual is supplied.

WATFORD'S 1200 BAUD FULLY AUTOMATIC USER TO USER SOFTWARE

Having purchased the WATFORD PRESTEL TERMINAL which includes the 1200/75 baud MODEM 84 the addition of the WATFORD user to user ROM based software enables you to discover a whole new world of data communication.
This software enables you to use the MODEM 84 very powerfully.

● Send and receive error checked programs and files (even WORDWISE files) to and from other users at 1200 baud.
● 8k file transfer in under 2.5 minutes (approx four times faster than with 300 baud modems).
● The transfer of data is totally AUTOMATIC which means that the modem is automatically switched between transmit and receive under software control.
● A chat mode is provided which also has this automatic switching for receive and transmit. (This mode is essential just before and after data transfer when both hand sets are replaced to reduce noise).
● A copy facility is provided which allows transmission of all screen output.
● A continuous on screen modem status report is included.
● The software is totally function key driven enabling easy transmission, reception, saving and loading of programs and files (Basic, Machine code or Data).
● A help menu is available from within the software as an aid to use.
● Full instructions are supplied.

PRICES

MODEM 84 (with Lead & Manual) **£68**
MODEM 84 complete with PRESTEL SOFTWARE ROM, Lead and Manuals **£82**
PRESTEL SOFTWARE ROM + Manual **£20**
USER to USER SOFTWARE ROM **£15**
(Carriage on Modem **£2**)

VIEW

VIEW WORDPROCESSOR
We are supplying the new VIEW version 2.1 allowing printing of memory contents etc. . . **£49**

FX80 PRINTER DRIVER

Watford's own Sophisticated VIEW Printer Driver for FX80

To simplify using the full facilities of the Epson FX80 or Kaga KP810 use this printer driver. Full facilities are provided for selecting between fonts etc. The disc includes examples of use and instructions. Available on 40 or 80 track disc (please state which required). **£6**

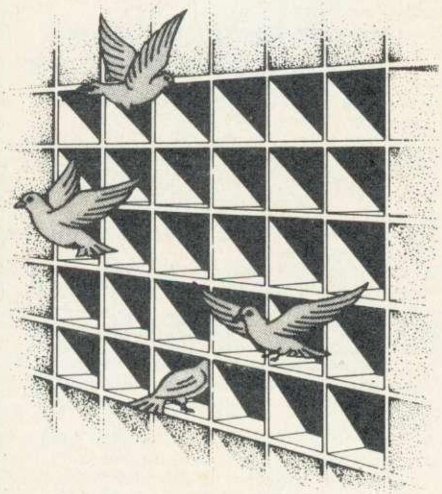
VIEW PRINTER DRIVER FOR SILVER REED

(Officially approved by Silver Reed)

A range of VIEW Printer drivers to complement the Silver Reed range of Printers and Typewriters. The View driver allows access to all of the features supported by the range of daisy wheel printers (EXP 770/400/500/550). These include underlining, bold, shadow, superscript, and subscript printing. Additionally, you can use proportional spacing on the EXP 770. Owners of one of the typewriters in the range EX 55/44/43, using it as a printer, can also access underlining with these drivers.
The features of each printer/typewriter are accessible from the two highlight codes, which can be redefined at any point within the text. The printer drivers also extend the facilities in View to allow the use of pad characters.
The printer driver on disk with a user manual is at a special introductory price of **£7.50.**
Please specify printer type when ordering.

WATFORD
Continued →

TWO DATABASE MANAGEMENT SYSTEMS



DISCDATA

Discdata is an entirely disc based database handling system. It is extremely easy to use through its comprehensive menu system. The simplicity is such that we do not feel the need to provide explanation on use in the written guidance supplied with the program. The first-time database user will rapidly become familiar with this package designed throughout to be simple and obvious.
Despite the ease of use this system provides all the facilities needed for complex data handling problems. The length of database that can be handled is only limited by the total space on the disc. You can have up to 20 fields with page length records up to 254 bytes in length. Adding and deleting records, amend titles, field names and records. Sort on any field and search for any record or group of records in any field. The database may be re-formatted after creation, the system will re-write all your files for you automatically. You may add extra fields and extend the length of existing fields freely.
Output formatting is very powerful. You are allowed 40, 80 or 132 column output modes going to printer or screen. Selected fields can be put in any order on the screen or printer, either across the paper or down. Output can start or stop anywhere in the file. Decimal fields are automatically totalled and records output are counted. Version 2, now on sale has improved input and amendments procedures giving full record edit as well as the 3 extra features . . . String searching, Calculations on numeric fields, and the ability to create sub files from your main files.

On disc at **Only £17**

(Please specify 40 or 80 track when ordering)

FILE-PLUS

The File-Plus package is even more powerful and flexible than Disc-Data. It is also largely menu driven but has its own command language for file searching. The 16K ROM contains all the normally required routines, with lesser used options supplied on the utilities disc. All input and output formatting is controlled through screen forms. A full screen editing system is used to define a form which allows tremendous flexibility in the format in which your data is displayed. It is very easy to change from form to form so that you can type in your data with one form, and examine it with others. You will typically design several forms before starting to access the database so that you can quickly and easily see the fields of each record that you want to appear in the layout you decide on. The form system is also used for output to your printer.
File Plus has a unique file linking system that allows the entire on-line storage of your system to be used for one database. This can give around 1.5 Megabyte databases using dual drives and double density.
The built in FQL (File-Plus Query Language) can be used for searching the database. Presented in the form of a powerful command language with looping facilities etc. this allows the most flexible access to your data possible. Full arithmetic operations are provided to allow the system to be used for statistical analysis.

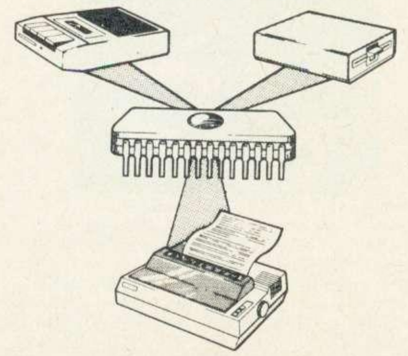
Cont.

Operations supported are −, +, *, /, +−999999 9999.9999 and compare facilities =, >,<>,<=, >=, <, &,.
Many keywords are supported by the language: assign, compare, display, end, goto, iff, ift, print, read, search, spool and update.
Supplied with a very detailed 70 page manual to explain all the facilities with many examples.

Only £43

(Please specify 40 or 80 tracks for the utilities disc)

BUFFER & BACKUP ROM



For those with sideways RAM fitted in their machines this utility ROM will make full use of this facility. By using the sideways RAM area for extra memory the following features are implemented:
★ 4K or 16K buffer for parallel printer.
★ Dumps selection of Disc files to Tape.
★ Makes backup copies of tapes on to tape and disc.
★ Displays contents of paged ROMs on screen.
★ Menu display of ROM filing system contents on Shift-Break.
★ Comprehensive manual.

Only £22

DATAGEM

Gemini's 24K ROM based DATABASE Management System
Special Introductory Offer: **£99**

PEN PAL—VERSATILE LIGHT PEN SOFTWARE

Do you have a light pen that never gets used? Then this piece of software is for you. This package offers many useful facilities that make the light pen a useful device to own. Facilities included are:
● Pixel, Line and Character definition
● Free hand drawing
● All Colours
● Fill, Refill and stripes
● User defined "Brush strokes" plus character definer
● Grid, Scale and perspective aids 2 to 200 points palletable in one design with Circles and "rubber banding"
● Move design/character to any screen position
● Save and Load screens, User defined characters and line drawings for video titles, own programmes etc.
This program has many uses in education and at home. It is supplied with a comprehensive instruction manual.
Works with Watford, RH, Acorn User, DIY and many other Light Pens.
Prices

TAPE	£10
DISC (40 or 80)	£11

DISC EXECUTOR

Disc Executor is a sophisticated disc utility for the transfer of your cassette programs to disc. If you have difficulties transferring your cassette software to your disc system then this is the answer. It handles 'locked' files and full length adventures (up to &&e blocks) and programs that load below &E00. It is very simple to operate with instructions supplied. It saves you time and money.

Price **£10**

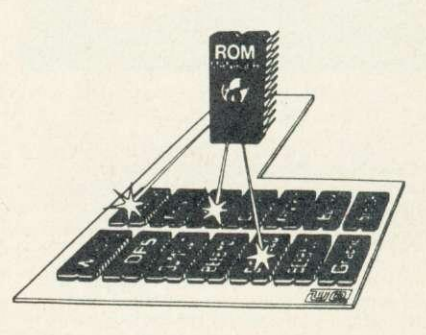
(Please specify 40 or 80 track discs)

ADE

Complete program development package in a 16K ROM. Full assembling and debugging facilities provided.

SPECIAL OFFER ONLY **£43**

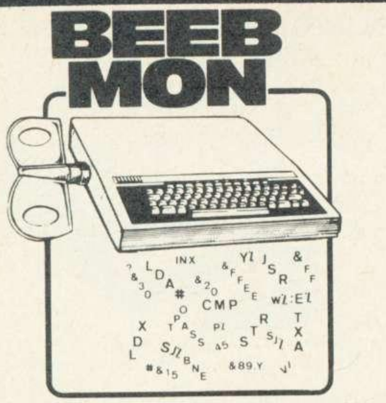
ROM MANAGER



This ROM is unique in its capabilities. It allows you, the user, full control over the BBC Micro's sideways ROM paging system with simple to use commands. This ROM is essential for those with several ROMs. At a simple level ROM MANAGER can be used to remove the problem of clashing command names and allow full use of all the facilities of your ROMs. This is coupled with facilities to completely enable or disable various ROMs in the machine including ROM manager itself.
ROM MANAGER can also be used to develop sideways ROMs using the machine's standard memory. This is achieved by sending sideways ROM calls to your code in RAM, saving the expense of fitting sideways RAM for ROM development purposes. ROM status reports are also given by the ROM, including ROM lengths, checksums, entry points supported and current filing system title.
The ROM also provides facilities to examine ROMs, list function keys for editing, modify RAM (using a HEX/ASCII editor) and list ROM titles neatly and concisely.

The commands given in the ROM:
* **CHECKSUM** – Generates a CRC for a specified ROM (useful for testing suspected faulty ROMs).
***DIRECT** – Passes a command directly to a named ROM (overcomes command name clashes).
***EXAMINE** – Allows examination of a named ROM
***EXPLAIN** – Gives detailed explanation of the first 22 *FX codes.
***FILE** – Passes a command directly to the current filing system (which normally receives commands after all the ROMs).
***FUNCTION** – Lists the contents of the function keys in a form suitable for editing.
***INCLUDE** – Allows the main memory to be used for ROM development.
***MODIFY** – Memory editing in HEX/ASCII format.
***NAMES** – Lists the names and socket numbers of all resident ROMs.
***RAM** – Sends command directly to the RAM based ROM routine.
***REMOVE** – Removes RAM based ROM option.
***SPECIFY** – Selects the default ROM.
***DEFAULT** – Sends commands directly to the default ROM without having to give its name.
***STOP and *START** – Disable and enable any named ROM to completely eliminate command word clashes.
***STATUS** – Information about all the ROMs fitted in the machine including socket number, name, length, whether it is enabled, whether it has service or language entries etc.
***VALUES** – Gives ROM MANAGER status information, such as its socket number, how many ROMs have higher priority, number of default ROM and the identity of the current filing system.
***VECTOR** – Same as *DIRECT, just in case *DIRECT clashes with another ROM.
All selection between particular ROMs is by the name of the ROM and this may be abbreviated for convenience. ROM numbers can also be used if required. This ROM is very simple and obvious to use. All the facilities are explained in the clear and detailed manual.

Price **£22**



Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

The most powerful and versatile machine code monitor ROM yet written for BBC Micro. It has all the normal memory editing, moving and relocating facilities, plus all editing is with a full screen editor allowing scrolling up and down memory, entering in Hex, ASCII or standard assembler mnemonics.
In use as a debugging tool, you run code under a total emulation system. Everfelt a desperate urge to set a break point in ROM? No problem – you can even have breakpoint on reading or writing locations in memory and on register contents. The system fully supports debugging of sideways ROMs e.g. BASIC can fully and easily be run from within Beebmon and from there DFS and other sideways ROMs can be used in total emulation mode.
Beebmon can even run itself. In so doing you can nest Beebmon up to a level limited only by the memory size. Beebmon uses 256 bytes of workspace, located anywhere in memory, even on the 1MHz Bus. Beebmon effectively uses no zero page workspace, so your program (e.g. BASIC) can use any or all of the base page. How does it achieve this? By providing a 6502 interpreter all programs running under it exist in a vertual BBC, so special memory locations like the ROM latch are not actually accessed by your programs, instead they alter a location in Beebmon's workspace. Emulation also allows immediate return to Beebmon command level by ctrl-escape no matter what code is being excuted at the time. All this exceptional power and flexibility is complemented by a clear and detailed manual included in a value for money price of:

£22



Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use programmers tool.
A ROM based machine code Disassembler for the BBC micro. It enables machine code programs to be listed in BASIC/DUMP format and thus is the perfect complement to the built in assembler. It allows Sideways ROMs, files on disk or tape to be listed, and also has a comprehensive editor, allowing mnemonics to be altered directly, as well as HEX, DECIMAL, ASCII and BINARY memory editing. There is also a full set of labelling facilities available (up to 3,200 labels), with the major locations and routines already labelled.
Thus DIS-ASM enables any monitor program, such as BEEBMON to be used to much greater effect as it is not necessary to disassemble memory each time the display is altered.

ONLY **£18**

WATFORD – Always a step ahead

COMPUTER CONCEPT'S ROMS

CARETAKER Basic Utility	**£28**
Graphics ROM	**£28**
Disc Doctor ROM	**£28**

Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER THIS MONTH: **£32**

BEEBFONT ROM

BEEBFONT is a remarkable and different concept in BBC software supplied on a 16K ROM. It allows you to display text on the screen in any of the following styles:

ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP

ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP

ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP

ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP

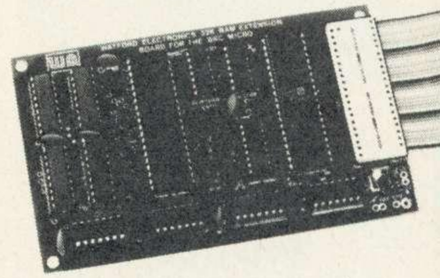
ABCDEFGHIJKLMNOP

It works in modes 0, 1, 2 and 4 using the full colour capabilities of each mode. Characters are printed in the same way as normal. Selection between the various fonts is very easily achieved with Ctrl-V – press this followed by a font number and the output will continue in the new font. Beebfont ROM is particularly useful in display work with the characters produced at twice the normal size.
You can create your own character fonts with the editor supplied. You can also print-out pre-formatted text files using the special characters with Epson FX, RX and NEC printers. The full range of character styles can be used, controlled from within the text. The editor and spooler program are supplied with the package, on cassette or disc. The spooler allows word processor (Wordwise & View) output to be printed in the new characters.
A twenty page manual is supplied. Please state printer type and media for the editor & spooler when ordering (cassette, 40 or 80 track disc).

ONLY **£39**

NEW LAUNCH

Watford fills the gap with a 32K RAM EXPANSION BOARD



Now Watford Electronics brings you the latest state-of-the-art memory expansion board for your BBC microcomputer. This compact board which fits inside the computer does not just give you 16K or even 20K of extra RAM, but a massive **32K!!!**

There are many useful facilities available with this board:

- The top 20K of the expansion RAM can be used as the screen display memory, leaving all the standard BBC RAM free for programs or data storage. This allows good graphics and long programs to be combined. For instance you could have MODE 0/1/2 GRAPHICS AND 28K OF PROGRAM SPACE. The extra memory can be used by virtually any language or utility such as BASIC, VIEW, WORDWISE, etc.
- The full 32K or the bottom 12K of the expansion RAM can be used as a buffer for the printer, sound channels, RS423, keyboard or speech synthesiser. This allows very long text files to be printed while you are using 27K of program and 20K of graphics!
- This board is the ideal complement to any word processing system. There is no need to wait for slow printers as you can type in long text in 80 column display mode while printing is going on – TWO JOBS DONE SIMULTANEOUSLY!!! (an equivalent printer buffer would cost you £115+).
- The board is compatible with a vast range of software and hardware available for the BBC microcomputer, including our ROM expansion board and double density DFS.
- The board is extremely easy to fit. It is supplied complete with a comprehensive manual and ROM based software with full *HELP messages.

SPECIAL OFFER
Only: £69 (carr. £1)

GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimension to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

SPECIAL OFFER **£105**

All Prices Exclude VAT

WATFORD
Continued →

SURGE PROTECTOR Plug

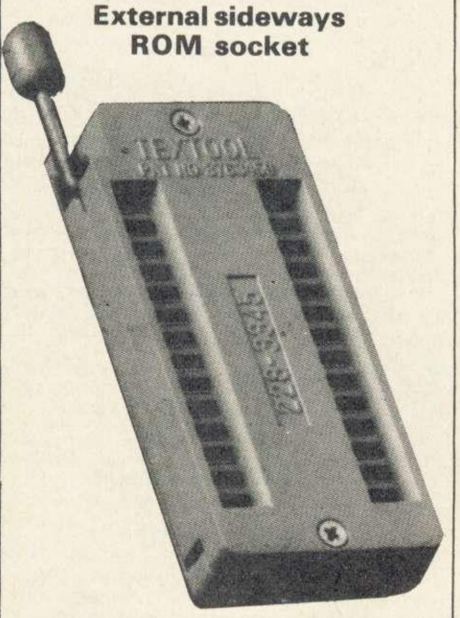
Fitted in place of your normal mains plug, this device protects your equipment against mains surges. Nearby lightning strikes, thermostats switching and many other sources put high voltage transient spikes on to the mains. This can lead to data corruption in memory and on disc and can result in spuriously crashing machines. Suitable for computers, Hi-Fi, Fridge Freezers etc. Max. Surge current 2KAmp; max. Voltage 250. Essential for serious computer users.

Protection for only **£8.50**

NEW LAUNCH

SIDEWAYS ZIF

External sideways ROM socket



At Watford we haven't forgotten those of you with small budgets, so we've produced a ROM board which takes only one ROM! But don't stop reading – this ROM can be changed in under five seconds without taking the case apart.
The SIDEWAYS ZIF eliminates the possibility of damage to your ROMs as zero insertion or extraction force is required when changing ROMs.
Included in the SIDEWAYS ZIF package is a specially designed see through storage container for your ROMs which protects them from mechanical and static damage when not in use.
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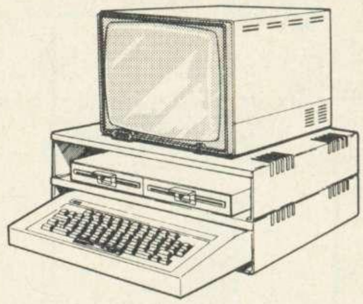
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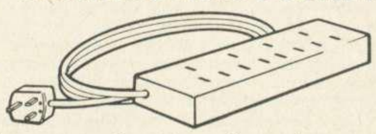
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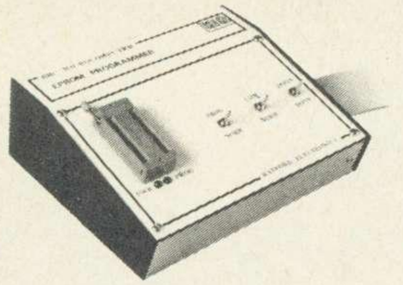
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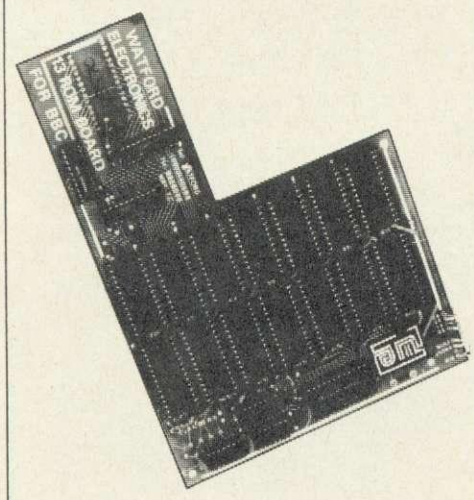
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AU11

CO-ORDINATED MOVES

It's easy on the Beeb and Electron to draw shapes on-screen and then assemble them, says Tessie Revivis

Two aspects of the Electron and BBC micro set these machines apart from many of their contemporaries. These are the ability to produce graphics using simple and clear commands and the ability to allow sections of programs to be called by a name assigned to them and also allowing numeric values and strings to be passed into them. In First Byte this month we'll examine these features, and lay down the foundations for the construction of a simple but effective computer aided design (CAD) package.

Both Acorn micros have what are termed graphics screens – in fact they have a total of five graphics screens, which differ in that they use varying amounts of memory and that only a set number of colours are available in each one. Selecting a particular graphics screen is performed using the command:

```
MODE n
```

where n is the number of the mode. Table 1 details the colours and amount of memory used by each screen mode. We can see from it that the 16 colours implemented on the Electron and Beeb are available all at once only in mode 2.

To allow lines to be drawn on the screen two commands are provided: MOVE and DRAW. If we imagine that we have an imaginary graphics pen the MOVE command moves it to a specific point on the screen (as though poised over a piece of paper), while the DRAW command puts the graphics pen on the 'paper' and draws a line from its current position to another specified position. A particular point on the graphics screen is specified by using a co-ordinate system. The screen is divided off horizontally and vertically into lines, like a page of graph paper. The vertical lines, termed the Y axis, are numbered from 0 to 1023. The horizontal lines are numbered 0 to 1279 from left to right, and termed the X axis. Thus any position on the screen can be specified or defined by its X, Y co-ordintes. The point 100, 100, for example, is found by moving 100 points along the X axis and then 100 points up the Y axis.

Figure 1 illustrates the co-ordinates for each corner of the screen. The bottom left-hand corner has the co-ordinates 0,0 and this is referred to as the origin, as every movement we make will be referenced from this point.

If we want to move the graphics pen to the co-ordinates 100,100 we use a line like this:

```
20 MOVE 100,100
```

However, before running a graphics program we must remember to select the desired graphics mode, so the preceding line 10 might read:

```
10 MODE 2
```

If we want to draw a line across the screen from this point the X,Y co-ordinates of the end of the desired line must be specified as part of the DRAW command, thus we could add the line:

```
30 DRAW 1000,100
```

Running the three-line program would cause a white line to be displayed on the lower portion of the screen.

By combining sequences of DRAW commands it is possible to construct shapes. A square or rectangle is simply four lines, each at a right angle to the previous one. A simple rectangle drawing program would be:

```
10 REM Square
20 MODE 2
30 MOVE 100,100
40 DRAW 1000,100
50 DRAW 1000,1000
60 DRAW 100,1000
70 DRAW 100,100
```

As you can see, we require only one initial MOVE statement to set up the starting position of our imaginary graphics pen. At the end of each DRAW command the pen will be correctly positioned. Figure 2 charts each DRAW movement. Note also how the last DRAW command in line 70 returns the graphics pen to its original position.

Often when writing a Basic program sections are repeated several times. If these are quite short, perhaps just a couple of lines, it is easy to type them in wherever they are needed. But if the repeated items are longer entering them several times is laborious and eats away the micro's memory.

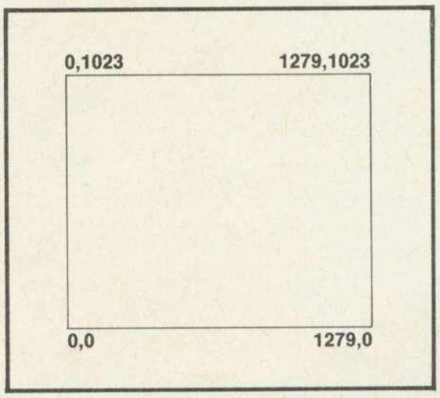


Figure 1. Co-ordinates of each screen corner

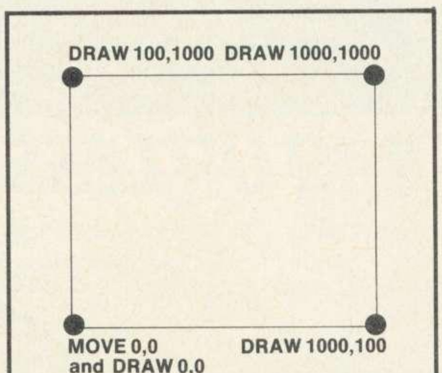
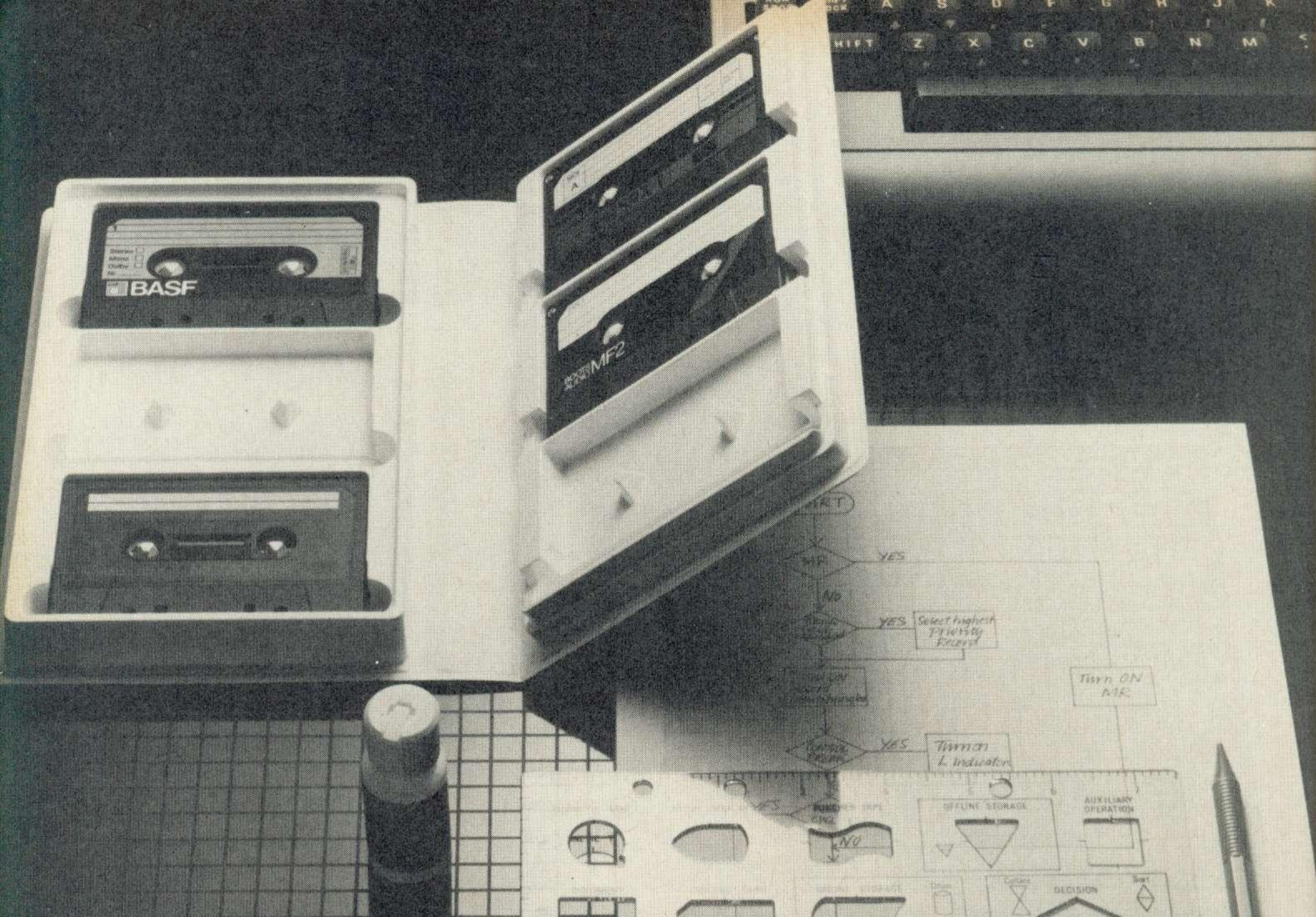


Figure 2. The DRAW stages

Consider the rectangle program. Suppose we wanted to draw this four times on the screen. We could enter the listing four times, but a much better programming technique would be to define the rectangle-drawing program as a named procedure and then call

Tessie Revivis' car-drawing program (listing 1) is presented on yellow page 100


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it four times. The name-defining sequence is performed using the two statements DEF PROCxxxx, where xxxx is the name (it could be of any length) we wish to give that procedure. DEF

'Producing routines in this way enables you to build up a procedures library'

PROC is short for DEFine PROCedure. To call the procedure 'rectangle', therefore, the listing would become:

```
1000 DEF PROCrectangle
1010 MOVE 100,100
1020 DRAW 1000,100
1030 DRAW 1000,1000
1040 DRAW 100,1000
1050 DRAW 100,100
1060 ENDPROC
```

To terminate the procedure the command ENDPROC is used (line 1060). You'll have noticed that I have now used higher line-numbers for the procedural definition. This is standard practice as procedures are normally placed towards the end of a program listing. To test the procedure it can be called simply by specifying the PROC and its name. Add the following lines:

```
10 REM PROC demo
20 MODE 2
30 PROCrectangle
40 END
```

The END command in line 40 is important as it stops the program running into the procedure definition and trying to re-execute it. Run the program to see the rectangle drawn on the screen.

To draw the rectangle four times the PROCrectangle statement can be put into the program four times, but there's a problem. The parameters (references) for the MOVE and DRAW commands within the procedure are fixed and cannot be changed, so the rectangle will be drawn in the same position each time. To avoid this we specify the parameters of each command as variables. Thus lines 1010 to 1050 become:

```
1010 MOVE X%,Y%
1020 DRAW X1%,Y1%
1030 DRAW X2%,Y2%
1040 DRAW X3%,Y3%
1050 DRAW X%,Y%
```

Looking at the above listing we see that we need a total of eight variables (the starting point is the same as the completion point). The next step is to specify each of these variables in the DEF PROC line so that the computer knows that it must put values into them. Line 1000 therefore becomes:

```
1000 DEF PROCrectangle (X%,Y%,
X1%,Y1%,X2%,Y2%,X3%,Y3%)
```

The PROC calling line can be used in the same way by placing the values to be passed into each variable within brackets, thus:

```
30 PROCrectangle (100,100,1000,100,
1000,1000,100,1000)
```

Now when the program is run the eight numeric values above will be passed into the eight variables in line 1000.

This approach is still a bit untidy and can be cleaned up. To produce a rectangle all we really need to pass into the procedure is the MOVE coordinates and then the length of two adjacent sides. We can then let the procedure do the donkey work. So the final program to draw the four rectangles looks like this:

```
10 REM Four Rectangles
20 MODE 2
30 PROCrectangle (100,100,300,
300)
40 PROCrectangle (100,600,200,
300)
50 PROCrectangle (600,100,250,
350)
60 PROCrectangle (600,600,350,
350)
70 END
80 :
1000 DEF PROCrectangle (X%,Y%,
XS%,YS%)
1010 MOVE X%,Y%
1020 DRAW X%+XS%,Y%
1030 DRAW X%+XS%,Y%+YS%
1040 DRAW X%,Y%+YS%
1050 DRAW X%,Y%
1060 ENDPROC
```

One of the useful aspects of producing routines in this way is that it enables you to build up a procedures library. Just save each PROC to tape as you design it and then load it in as and when required.

Mode	Memory required	No of colours available
0	20k	2
1	20k	4
2	20k	16
4	10k	2
5	10k	4

Table 1. Colour and memory details

Listing 1 provides a variety of procedures that will perform the following:

- PROCrectangle – draw a rectangle
- PROCtriangle – draw a triangle
- PROCcircle – draw a circle
- PROCfillrec – draw and fill in a rectangle
- PROCfilltri – draw and fill in a triangle
- PROCfillcir – fill in an already drawn circle

The controlling program uses these calls to draw a car in multi colours like

'We can then let the procedure do the donkey work'

the one in figure 3. These procedures will be explained in full next month, but for the time being see if you can use them to draw your own designs.

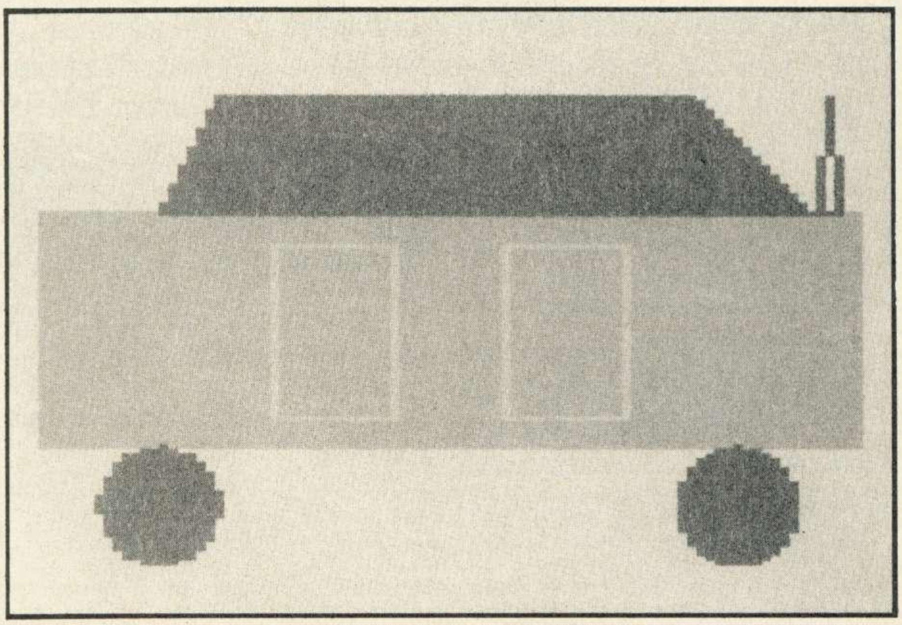


Figure 3. CALL me a car! – assembled from simple rectangle, triangle and circle routines

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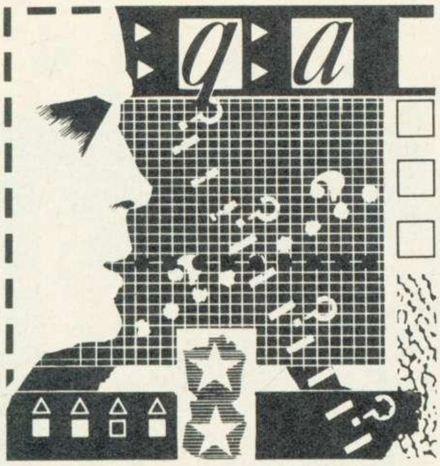
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Martin Phillips advises on TV modification, polishing programs, joystick commands, 3D printing, cassette care – and draws a house

Can I convert my TV into a monitor?

CAN a colour TV be modified to act as a monitor, asks Mr Wilson of Bordon. 'As the current price of colour monitors is so high,' he writes, 'and as I already have a second-hand colour telvision, I was wondering whether it is possible to modify it to improve the picture quality. With a video monitor there is no tuner, sound and vision detection, or sound amplification circuitry. If I understand correctly, using a TV with a micro means that the micro output is first modulated, and then demodulated. Is this why the image begins to lack stability?

'I have noticed recently a variety of combined monitor/TV sets in several stores. Is this combination achieved by switching off the unwanted circuitry, and if so could the same thing be achieved simply at home, or is there something more complex involved?'

A simple answer is that a television could be modified to work as a monitor, and there would be some improvement in picture quality for the reason Mr Wilson has suggested. But – and it is a big but – it is not a simple task, and the gains in picture quality are not great, for several reasons.

First the picture tube in a TV is not the same as that in a monitor which generally has a better resolution screen and with an anti-glare coating, so even if a television is modified the picture quality is still not as good.

Second, new colour TVs (within the last two to four years) have isolating transformers fitted, as do monitors. Older televisions have a chassis, which could become live under certain fault conditions. Should this occur while the computer was plugged into an unprotected monitor socket the computer could be badly damaged. So you'd have to fit an isolating transformer or circuitry onto the monitor socket.

Thirdly, earlier colour TVs (10 or more years old) have picture tubes which emit undesirably high levels of radiation. These are not to be recommended for close viewing with a computer.

Lastly, the internal circuitry of televisions and monitors has improved considerably in the last few years, and this too has contributed to a better picture. Older TVs often need realigning to restore their original picture quality, and this in itself is not a job for the unskilled.

In short, unless television circuits are something with which you are familiar, don't try to alter an old set. (There are some high voltages in a colour TV which can be dangerous.) It is a false economy as colour monitors that should give years of trouble-free use are coming down in price all the time and their cost compares well with a new colour TV. As an alternative, the monitor/TV sets now in the shops seem to be a good buy, although I would like to take my computer into the shop and try it out on one before buying it!

Special effects

ROBIN SASSON from Slough has sent in a series of VDU23 commands (figure 1). As far as I can see they have no practical use (sorry Robin!), but they are fun. Most will only work on the BBC in mode 7.

```
VDU23;1;0;0;0;
VDU23;2;0;0;0;
VDU23;4;0;0;0;
VDU23;7;0;0;0;
VDU23;8;0;0;0;
VDU23;9;0;0;0;
VDU23;100;0;0;0;
VDU23;106;0;0;0;
VDU23;996;0;0;0;
VDU23;998;0;0;0;
VDU23;999;0;0;0;
VDU23;1000;0;0;0;
VDU23;9000;0;0;0;
VDU23;16013;0;0;0;
VDU23;19014;0;0;0;
```

Figure 1. VDU commands from Robin Sasson. Try the effects

Perfecting your programs

SETTING a time limit using the INKEY statement in a tables testing program for his son caused problems for Mr Tate of Henley-on-Thames. His program is given in listing 1. I have sorted out his query, and then polished it stage by stage from the working program.

I know many users wish they could perfect a program, and when you first start this takes a long time, but it is surprising how you speed up with practice. Eventually you realise a perfect program is unattainable as there is always something more to be added or improved. What makes the task harder is the variety of solutions to a problem, and the 'best' way is often a matter of personal choice. *page 47* ▶

Listings 1-4 (multiplication table tests) are presented on yellow page 101 and 102

IF YOU have a technical hitch or a programming problem let Martin Phillips give his diagnosis. We'll pay £5 if you raise a really interesting point. Please give full details of the system you're using and include a listing where appropriate, making your question as specific as possible. WRITE TO: Hints & Tips, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

Listing 2 shows the first changes made to the program. Line 260 has been shortened as the latter part of the line did not accomplish much, since the program would still wait for an input at line 270. Then three procedures were introduced: PROCright, PROCwrong, and PROCtimeout. This made the program easier to read, and the responses for a correct or incorrect answer could be improved with ease within each procedure.

Next I changed the position of the time test to after the right or wrong response. This way the child would know whether the answer was right or wrong even if he or she was out of time. Here I made a mental note to include an out-of-time result with the score. Also the instruction lines were altered to cater for the changes in the input routine.

It was interesting to note that the introduction of the three procedures meant that two repetitions of A= INKEY(200):GOTO 190 were redundant. They also avoided the need for long multi-statement lines, which would quickly have become cumbersome if extra effects were to be included.

Listing 3 shows the next round of alterations. First a REPEAT ... UNTIL loop was put in instead of a GOTO, making the program easier to follow. Then the results phase of the program was put into a procedure. (Some would tut-tut at having more than one ENDPROC in a procedure; the way round this is to use GOTO 560 and just retain one ENDPROC.) Now it was possible to take account of the excess time taken and print it out if necessary. One second extra was allowed for each answer before printing an out-of-time message to avoid having silly responses such as '... but took 0.02 seconds too long'.

Next the RND routines that filter out the number 1 were simplified, and I changed the maximum multiplier from 12 to 10. The need to learn up to the 12 times table disappeared in the early seventies when decimal money was introduced and schools started teaching measurement only in centimetres and metres instead of feet and inches. When writing an educational program it is necessary to look carefully at such aspects of the work being covered. However, it is surprising the number of teachers who still insist on teaching up to the twelve times table.

Listing 4 shows the final stage. The line of the program that displayed the question was printed in double-height, as was the answer. At this stage the program might seem perfect, but alas the changes introduced have made yet more problems. It is possible, for instance, to have '... but took 1 seconds too long', so there needs to be a line to check if the excess time is just 1 second and print an appropriate message. Perhaps the easiest way is to ignore a time excess of less than two seconds on the total. Then there are the sound effects to add. . . .

Mystery chip

A MISSING ROM socket was the problem of Simon Matterface from London, who writes, 'In all the books and magazines I've read, they say that the BBC micro should have three paged ROM sockets, but alas I have only two! I purchased a *Wordwise* wordprocessor ROM, and on taking off the cover and keyboard I found I had only two spare sockets. Not knowing what this extra chip was I tried to take it out, but I could not as it was soldered in place! The chip is totally blank. Can you suggest what I should do?'

No standard BBC has, to the best of my knowledge, ever had a chip soldered in place of any ROM sockets, so I would guess that Simon bought his micro second-hand. So what is the chip and why should it need to be soldered into the socket? Even if it becomes damaged, it is better to fit a new socket.

The only explanation I can think of was suggested by something I read last year (*Acorn User*, October 1983, News in Brief), about an EPROM that was plugged into one of the ROM sockets which disabled the computer until a five-digit security code was entered. It also caused the owner's name and address to appear when switched on. This was a good idea, but all too easy to unplug, so they were probably soldered in place. The only snag here is that as an EPROM can be erased in ultraviolet light, the chip could be wiped clean and the computer would work perfectly well without it. In other words, leave it on a windowsill in strong sunlight for a few hours and all security is lost. The result: one blank EPROM soldered into the circuit board doing nothing.

Joystick tester

THE ADVAL commands that control the left and right joysticks have been requested by Robin Sasson. This was covered in this column last February but for the benefit of Robin and the many new Electron users who have just bought the Plus-1 interface and wish to use joysticks, and any new BBC owners, here is a tester for joysticks to check if they are wired correctly. It also shows how they are read using the ADVAL statement. The BBC and Electron (with Plus-1) use the same commands and, as far as joysticks are concerned, the analogue port wiring is the same.

The Acorn joysticks do not operate quite as expected. Moving the joystick to the left in the horizontal axis increases the voltage to the analogue socket, rather than reducing it as one would expect. Figure 2 shows the

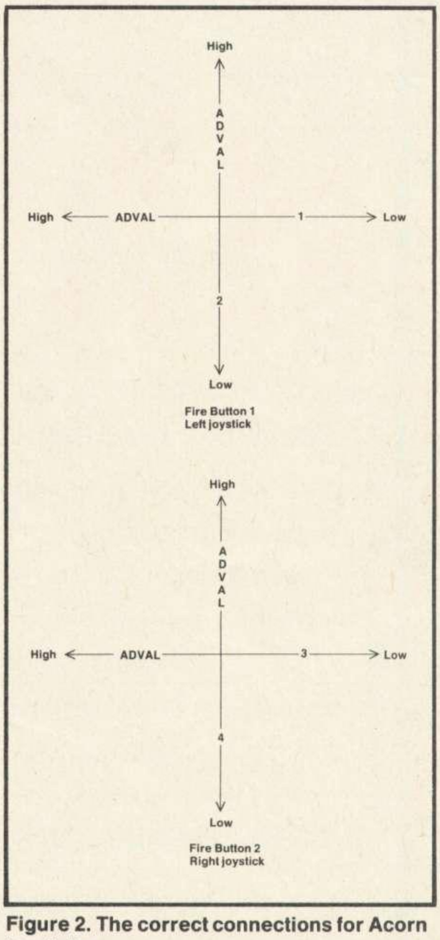


Figure 2. The correct connections for Acorn joysticks

correct connections for Acorn joysticks.

Listing 5 gives a short program to display the ADVAL readings for either joystick, and can help to distinguish left and right joysticks (why are they often not labelled?). It can also be used to check for non-standard joysticks, or simply to see that the joystick works correctly.

Do not worry if yours will not reach the maximum or minimum values (65536 and 0); they seldom do! Any value within 100 of these is usually satisfactory. On my Electron with Plus-1, the values were in the range 65280 and 0 with my pair of joysticks; 65280 is the maximum value the analogue port will

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give on the Electron, the maximum on the BBC being 65536. The BBC analogue port has a resolution 16 times better than the Electron with Plus-1. This means that it reads in steps of 16, whereas the Electron reads in steps of 256. However, the accuracy of the BBC's analogue port is a little suspect, and it is better to read the resolution in steps of 32 or 64 in the following way:

X = ADVAL(1) DIV 32
or X = ADVAL(1) DIV 64

Programming the Electron's analogue port is the same as programming the BBC's, although it is slower in operation.

If you have non-standard joysticks they can be altered, provided the cases can be opened. It is usually the horizontal movement potentiometer that is wired incorrectly. Check which potentiometer moves when the joystick is pulled horizontally (or vertically if that one is wrong). There are three solder tags on the potentiometer with wires on each. Leave the wire on the middle of the three tags and unsolder the wires on each end solder tag, swap them round and resolder. The potentiometers are not particularly heat-sensitive and this task is not very difficult. Unplug the joysticks from the computer before opening the case to avoid damaging the analogue-to-digital converter chip.

```
 10 REM listing 5
 20 REM Joystick tester
 30 @%=15
 40 INPUT"LEFT(0) OR RIGHT(1) "J%
 50 IF J%<0 OR J%>1 THEN GOTO 30
 60 REPEAT
 70 X=0:Y=0
 80 FOR N=1 TO 100
 90 X=X+ADVAL(1+2*J%)
100 Y=Y+ADVAL(2+2*J%)
110 NEXT N
120 IF J%=0 THEN PRINT"LEFT JOYSTICK:    ";
130 IF J%=1 THEN PRINT"RIGHT JOYSTICK:    ";
140 PRINT "X=";INT(X/100),"Y=";INT(Y/100)
150 UNTIL 0
```

Listing 5. Displays the ADVAL readings for left and right joystick

Three-dimensional printing

HERE IS a procedure to give the effect of three-dimensional printing (listing 6). It works only in the BBC or Electron's graphics modes (modes 0, 1, 2, 4 and 5), by joining the text and graphics cursors using the VDU 5 command. Once the two cursors have been joined, printing can be positioned on the screen at any point determined by the last MOVE, DRAW or PLOT statement. In this case the print is placed on the screen twice, the second just overlapping the first. The 3D effect is achieved by printing in different colours. The procedure parameters define the screen position, the string to be printed and the first and second colour numbers.

```
 10 REM Listing 6
 20 MODE 2
 30 VDU19,0,4,0,0,0
 40 PROC3d(352,900,"3D TITLES",3,1)
 50 END
 60 :
100 DEFPROC3d(X,Y,A$,col1,col2)
110 REM X values in range 0-1279
120 REM Y values in range 0-1023
130 VDU5
140 MOVE X-4,Y-4
150 GCOL0,col1:PRINT A$
160 MOVE X,Y
170 GCOL0,col2:PRINT A$
180 VDU4
190 ENDPROC
```

Listing 6. Gives the effect of three-dimensional printing on Beeb or Electron

Reinstating the cursor

IN AUGUST'S column I mentioned that the cursor could be switched off using

VDU23;8202;0;0;0;

Several readers have pointed out that it can be reinstated using the following command

VDU23;29194;0;0;0;

This works in mode 7 on the BBC, but not in any of the other graphics modes. The only reliable way I know of switching the cursor on again after issuing the above command is to change mode.

Damaged cassettes

I RECENTLY came across two cassettes that would not work at all. One had a blown internal mains fuse, the other had no internal fuse and the damage was more severe. Many people are careful to switch off the computer and the TV or monitor when they have finished, but do not realise that there is no mains switch in most cassette recorders. If they are connected to the mains then they are on and live. If left on for long periods (48 hours is usually enough) they will overheat and the internal fuse will blow, or worse damage will be sustained by the electronics inside the cassette.

Be warned, remember to unplug your cassette after use.

Quicker on the draw

ONE of the things that often puts me off typing in listings is long lines of programming or, even worse, long lines of DATA statements. I never manage to type them in correctly, and it is difficult to find where the mistakes occur. The READ...DATA statements are very useful and can save the programmer much time. If they are included in the listing with a little thought, they are easy to read and follow what is going on.

Listing 7 shows a simple routine to

read some data and use it to draw a simple picture of a house on the screen (figure 3). This is much easier than a long sequence of MOVE and DRAW statements, as the PLOT statement has been used instead. PLOT 4,X,Y is the same as MOVE, and PLOT 5,X,Y is the same as DRAW. PLOT 85,X,Y will fill in a triangle.

There are two ways to stop the routine trying to fetch another set of numbers when the picture is complete. One is to tell the computer how many sets of data it will have to read in the first place. This will be stored as a number at the start of the program, eg:


```
N%=15
*
*
FOR T= 1 TO N%
*
*
*
NEXT T
```

The method used below has a special control code at the end of the data to indicate where the end is. (In this case K with a value of 100, which is outside the normal PLOT range.) This has advantages because more data can be added in the middle without having to worry about changing the N%.

By using REM statements, leaving a line between sections, and by not putting a long series of data on each line, the program is easy to follow, and hence is easy to correct or adapt. For instance, try adding windows, or a chimney to see how extra data can easily be included.

Listing 7. Routine to read data and use it to draw house shown below

```
 10 REM Listing 7
 20 MODE 4
 30 VDU19,0,4,0,0,0
 40 REPEAT
 50 READ K,X,Y
 60 PLOT K,X,Y
 70 UNTIL K=100
 80 :
 90 REM *** WALLS ***
100 DATA 4,200,600,  5,200,200
110 DATA 5,1000,200, 5,1000,600
120 :
130 REM *** ROOF ***
140 DATA 4,1100,600, 5,100,600
150 DATA 5,300,800,  5,900,800
160 DATA 5,1100,600, 5,1000,600
170 :
180 REM *** DOOR ***
190 DATA 4,550,200,  5,550,400
200 DATA 85,650,400, 5,650,200
210 DATA 85,550,200
220 :
230 REM *** PUT THIS LAST ***
240 DATA 100,0,0
```

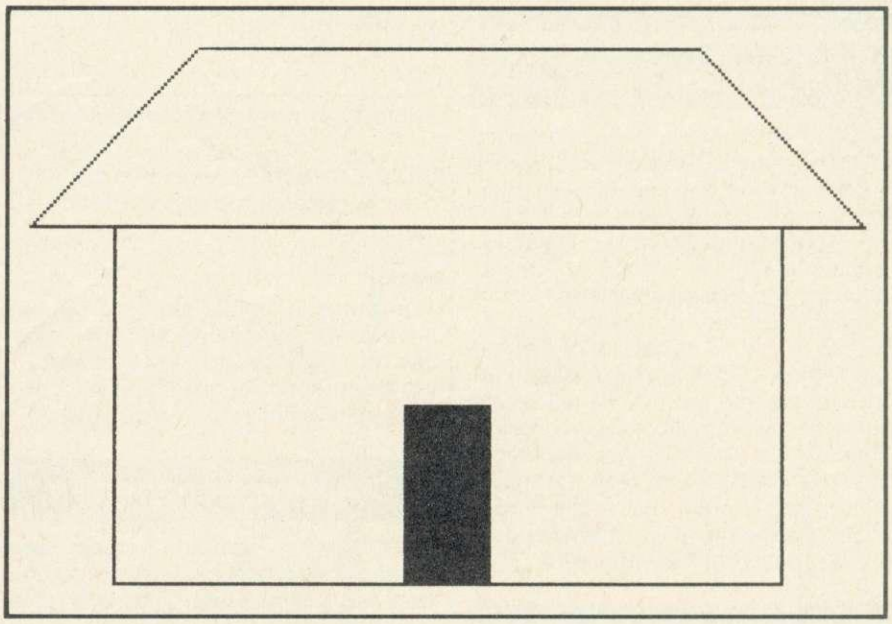


Figure 3. The house that READ. . .DATA built

Coupler sealed

A USEFUL tip for computer owners with acoustic couplers has been sent in by J Crossland of Banbury. It is designed to reduce the risk of their picking up external sounds, which cause errors. He recommends putting window draught sealing tape around the telephone receiver where it snaps into the coupler.

Line-spacing on Wordwise

HERE is a tip from C J Gaudion of Guernsey for readers who use *Wordwise*. It is not easy with *Wordwise* to space out a document correctly, but by redefining the space to a small dot in the middle of the line (to avoid confusion with a full stop), it is easier to insert the correct number of spaces required. This tip will only work when the document is viewed in mode 0, and does not affect the mode 7 display or the final printed version.

The space is redefined by typing the following line:

VDU23,32,0,0,0,24,24,0,0,0

This can be typed in before entering *Wordwise*, or at any time by typing *Basic first, and then returning to *Wordwise*. The line could be included in a key definition, or for disc users in a !BOOT file.

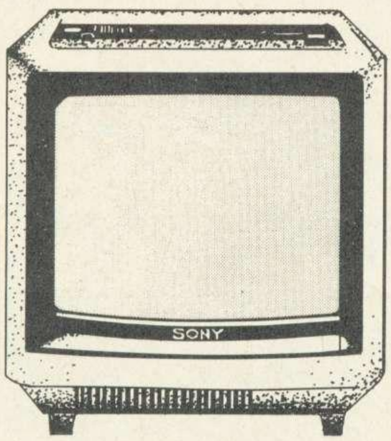
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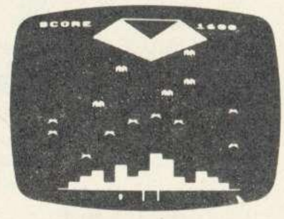
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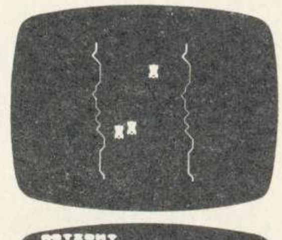
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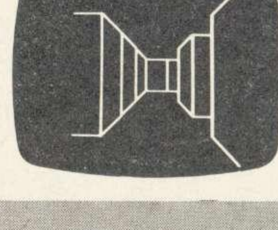
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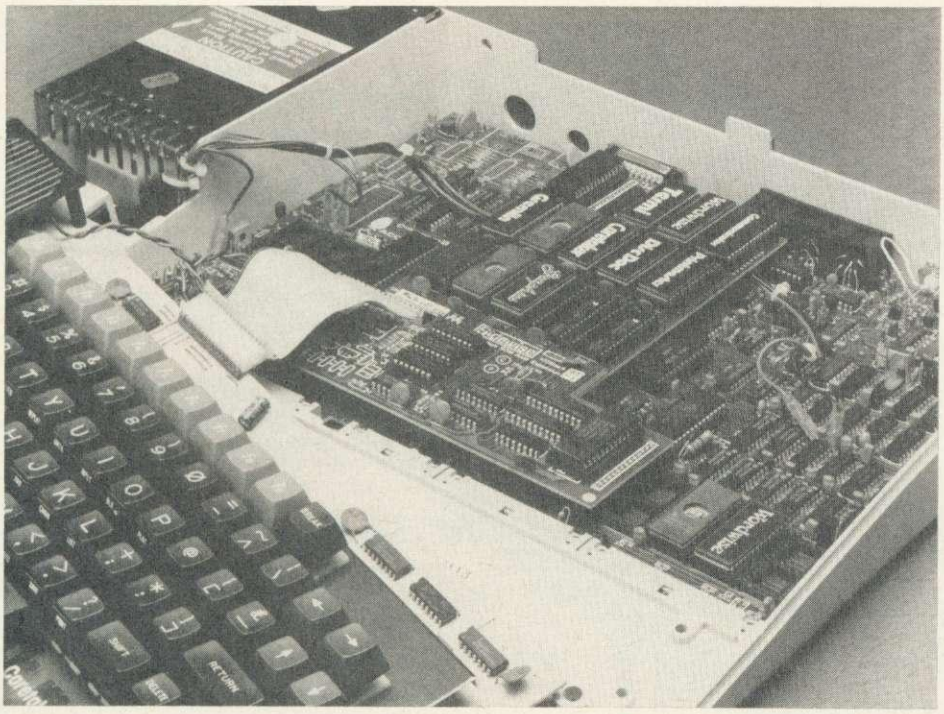
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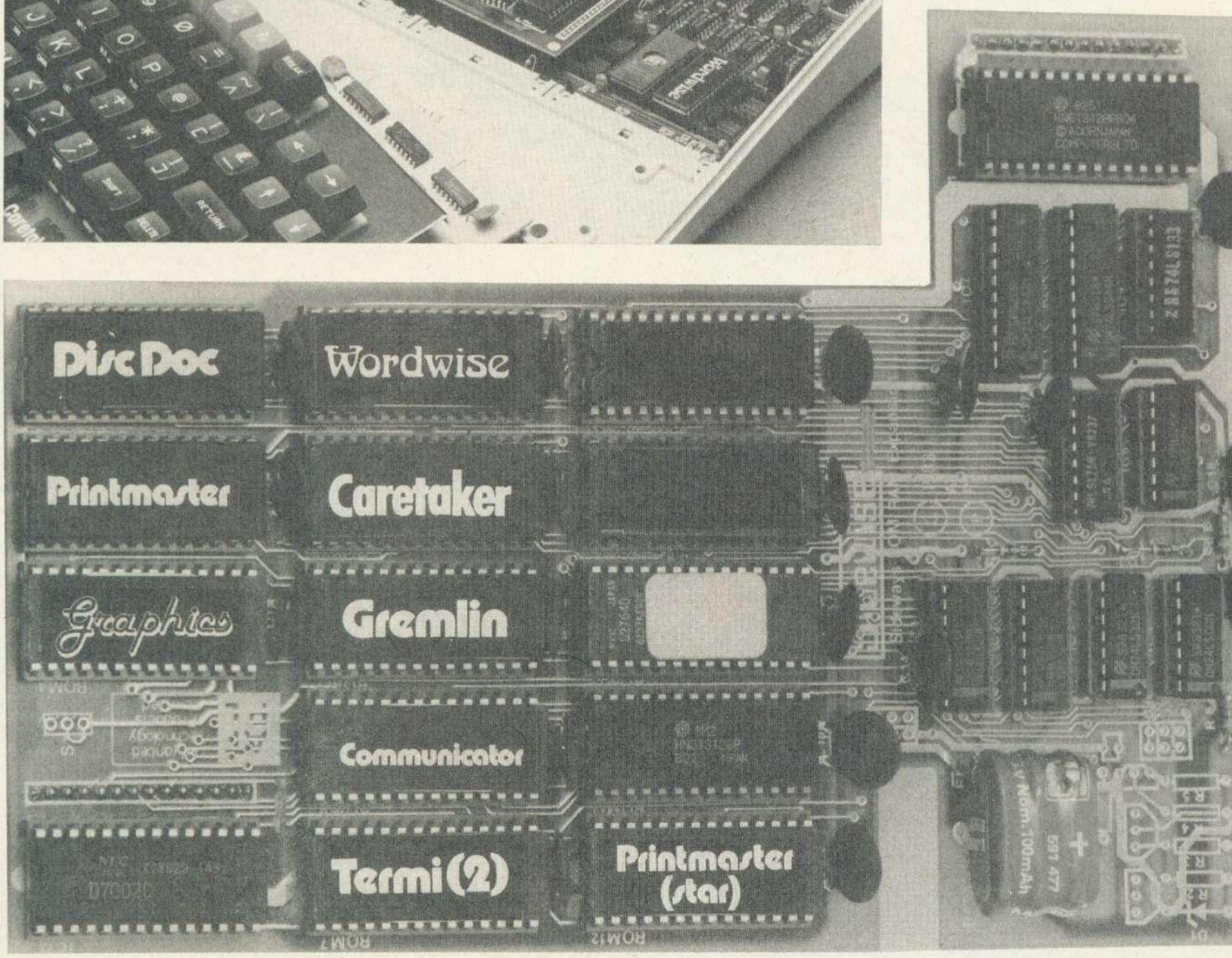
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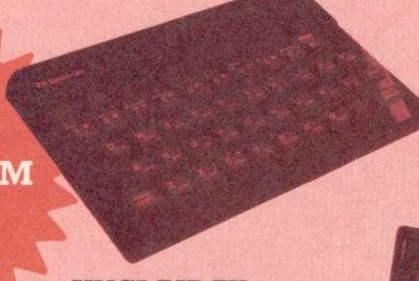


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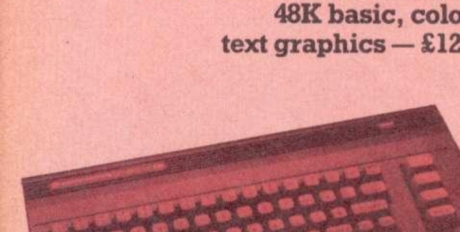


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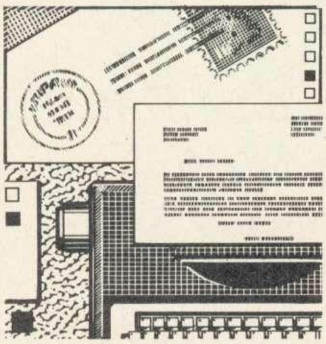
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Help and hints for Beeb users from RTTY group

Sir, I have read *Acorn User* since it was first published and I would like to say a few words about the article 'Unscrambling the airwaves' on RTTY by Robin Mudge in September's issue.

There is one organisation which specialises in keyboard communications including RTTY, AMTOR (AMateur Telex Over Radio), Packet Radio, etc: the British Amateur Radio Teleprinter Group. The current chairman is Stuart Dodson, G3PPD, 63 Malvern Avenue, South Harrow, Middlesex HA2 9EV (the membership secretary John Beedie, G6MOK is in the process of moving house).

A quarterly magazine published by BARTG, *Datacom*, deals with many aspects and levels of radio communications.

BARTG supplies PCBs, circuits and, in some cases, kits of parts for what we call 'terminal units' and which would be called in the computer world 'modems'. In particular, the ST5C is specifically for use with computers and is literally plug-in compatible with the BBC B. It is superior to many popular commercial units.

On another point, the inside of the BBC case can be sprayed with zinc to radically cut down the interference radiated from the computer itself, the other side of the coin being that RF interference from transmitters is less likely to upset the computer.

As a council member of the Radio Society of Great Britain, I think I should point out that the information given under the heading 'Useful books' on page 31 is not accurate. The Radio Society of Great Britain does not 'administer and govern all the amateur radio clubs', although about half of the radio amateurs in this country are members, and most clubs are affiliated.

Packet Radio is the most exciting thing on the horizon for computer-directed radio amateur communications. Radio amateurs throughout the world are still discussing suitable standards, although it looks as if the AX25 standard could well receive worldwide support.

I hope these remarks will be of use to readers.

Ingemar Lundegard
President, BARTG, G3GJW

Sir, In September's issue you gave us an interesting article on 'Unscrambling the airwaves'; thank you. You also gave the suppliers of the goodies a gift of an advertisement. To the unknowledgeable reader it all looks fine, but to a licenced amateur (call sign: G4PLW) I know your list of equipment is not necessarily the best available and certainly not the cheapest.

May I draw attention to the program written by Peter Harris (G3WHO) and the interface produced by Johnny Melvin (G3LIV). I have both items: they work, cost little and do everything I could wish for software-wise.

Peter Walker
Middx

Hitting out at high prices

Sir, I would like to voice criticism over the cost of purchasing peripheral equipment for the BBC micro. Without a doubt the model B is one of the best eight-bit home micros, and with its excellent operating system and Basic it is a real pleasure to use. However, I believe that the price of buying extra hardware is suffocating the machine's potential.

I would be pleased if equipment manufacturers could explain why it is necessary to charge between £199/£299 for a second processor, or £115 for a 20K video RAM board, or £55 for a speech chip, or £225 for a Prestel adaptor.

It is common knowledge that a great deal of computer market price setting is calculated on the 'what the market will stomach' basis. Compare similar pieces of equipment between the Sinclair, Commodore and BBC markets, and you can almost guarantee that the BBC item is the most expensive.

For the manufacturers this marketing policy holds three dangers. First, this country is beginning to see the introduction of very cheap all-in-one packages (eg Einstein, Amstrad, etc), which offer the buyer processor/disc drive and monitor in one low price. Against these BBC equipment appears grossly over-priced.

Second, the advent of 16-bit home micros looms. Micro enthusiasts are just one sector of the magpie-like consumer group that rushes out to buy the latest, brightest, fastest new product. If it costs too much to upgrade your existing micro, people will simply dump it and buy a new all-singing all-dancing 16-bit machine. The sheer power of 16-bit machines (ie QL, Advance, Apricot cheapie) is daunting. The basic coinage of micros is RAM. With more RAM, the greater the options, more can be done. Against these even the model B looks puny.

Third, the 'fashions' that run through the BBC hardware market could well evaporate. Last year it was disc drives, this year it's modems. Next year second processors? At £199 a throw I can't see them queuing at the door!

I Hayes
Surrey

6502 expensive

Sir, I would be interested to know why the 6502 second processor is so expensive. At £199 it is the same price as the Electron, which has a keyboard, interfaces and other chips. However the second processor just seems to be a processor with memory and the Tube interface, so why the high price?

Alan Bradley
Belfast

Second processor patch for Level 9

Sir, I write to you on two issues. The first concerns Mr Howard, who wrote in the September issue asking about the addresses of the floating point routines in Basic; the July 1982 issue of *Personal Computer World* carried the information.

Second, people who play Level 9 adventures on the 6502 second processor will have discovered by now that this produces at best garbage.

There is a simple reason for this and I have worked out a short Basic patch which should be loaded in and run after the body of the adventure has been loaded (into the second processor of course). Then save the amended version onto disc before using. The patch is program 1 below. Note there must be *six* NOPs at the end; if they are missed out the patch won't work properly.

In case you want to know why the program crashed in the normal Beeb the carry flag in the 6502 CPU is normally clear on returning from OSWRCH (this may not always be true but it is in this case). In the 6502 second processor, the carry flag is set on return from OSWRCH and in the Level 9 A-code interpreter it calls OSWRCH then has several RTS and executes the following code:

```
PLA:STA&60:LDA&60:
ADC#1:STA&60...
```

Note that the code relies (unwisely) on the carry flag being clear at the start of the addition causing ADC#1 to add two rather than one when the carry flag is set. As 60/61 contains the internal number of the piece of text to be printed out next, this causes great confusion when combined with their method of packing text.

Roger Hill
Guernsey

Level 9 has asked us to point out that this patch will only work on early versions of the adventures. Disc versions are now available at £11.95 which will run on the 6502 second processor.

```
10 A%=&74A7 :REM for Snowball And Time this number must be &74AC
20 P%=A%-2
30 [OPT3:INC&60:BNEP%+3:INC&61:NOP:NOP:NOP:NOP:NOP:NOP:]
```

Program 1. Second processor fix for early Level 9 adventures

Also, the company will upgrade to disc for just £2.50 (includes post) plus the cassette. The latest adventure, Return to Eden, will run on the 2P.

Bonus idea for function keys

Sir, In November 1983 *Acorn User* published an interesting program written by J Taylor under the heading 'Multi function keys' in Beeb Forum. It deserves a further airing for the benefit of readers who may have missed it. Indeed, it was only while browsing through some old copies that I realised its potential.

Type listing 2 in as shown for use with disk and run it (save it if you wish). If you now examine the catalogue you will see that program 'K' has been saved (line 340).

When starting up again from cold, just type *K (Return). Conditions are then such that you can load other programs, operate Escape and Break, while still retaining definitions of up to 40 user-defined keys. Operation of f0 cycles through four sets and displays the current set on screen.

At any time you can redefine a key (1-10) in the usual way, eg by typing *KEY5LIST (return). If you wish to retain this new definition, f8 in set 4 should be used. Just type Y in answer to the question and program 'K' will be adjusted, without disturbing another program being developed.

Lines 210 and 320 are useful variations to re-arrange the Break key so that time is saved when program writing.

David Polak
Leeds

page 61 ►

```
 10 REM:::::::::::MULTIKEY::::::::::
 20 REM:::cf ACORNUSER NOV 1983 p55::
 30 :
 40 C%=&8D0:REM MACHINE CODE ADDRESS
 50 REM:BUFFERS 1-4, BASE ADDRESSES
 60  B1=&B00:B2=&A00
 70  B3=&900:B4=&C00
 80 :
 90 P%=C%:[:OPT3:LDY £1
100 .L:LDX B1,Y :LDA B2,Y
110 STA B1,Y :LDA B3,Y
120 STA B2,Y :LDA B4,Y
130 STA B3,Y :TXA:STA B4,Y
140 INY : BNE L : RTS :]
150 :
160 DIM X% 30: Y%=X% DIV 256
170 PROCO(1)
180 *KEY1LISTO7|M
190 *KEY2LISTO0|M
200 *KEY3LIST|M
210 *KEY10OLD|MLISTO7|ML.|M
220 PROCO(2)
230 REM SECOND KEY SET *KEY1 - *KEY10
240 *KEY4:::::::HELLO TWO::
250 PROCO(3)
260 REM THIRD KEY SET *KEY1 - *KEY10
270 *KEY4:::HELLO THREE ***
280 PROCO(4)
290 REM FOURTH KEY SET *KEY1 - *KEY10
300 *KEY 1 MO.6|M VDU19;4;0;28,0,24,39
,0,23;12;0;0;0;|M
310 *KEY8P.´´" SAVE  *K  Y/N ":A$=INKE
Y$(1000):IFA$="Y"THEN*SAVE"K" 8D0+400|M
320 *KEY10OLD|MLISTO0|ML.|M
330 :
340 *SAVE"K" 8D0+400
350 END
360 :
370 DEFPROCO(N%) : CALL C% : *FX18
380 $X%="*KEY 0 CA.&"+STR$~C%+"|M P.""
Keys "+STR$(N%)+"""|M"
390 CALL &FFF7 :ENDPROC
```

Listing 2. A better way to make use of the definable function keys: for £ read #

Kitty strolls down memory lane for two puzzled readers



Q I've typed in several listings from various magazines and I often get a 'Bad Mode' error. I know this means the computer has run out of memory, but the program must have worked before it was put in the magazine. Or must it?

Bernard Walker
London

A The reason a 'Bad Mode' error is generated when a program is run is normally because there is not enough memory for both the program and the screen mode that the program selects to exist at once. There are several screen modes on the Beeb and Elk and these all require specific amounts of user memory to operate in. For example, mode 2 requires 20k – more than two-thirds of the user memory. If mode 2 is selected only a small amount of memory is left for you, the programmer, to use.

When you run a program that incorporates a mode-changing command your computer's operating system checks to see if there is enough memory left above the program to implement the required mode. If there is not then the Bad Mode error is printed.

How do you get around this? Well, the obvious solution is to shorten the program, but this will not always be possible and quite often there's another cause. If you have a disc interface fitted this will gobble up precious user memory. This memory can be claimed back by first typing *TAPE and then resetting the value of the variable PAGE which determines where usable memory starts. The sequence is therefore:

```
*TAPE
PAGE=&E00
NEW
```

Remember to press the return key after each command. Now enter your program, save it to tape in case of possible corruption, and try running it. Nine times out of ten this will solve the Bad Mode problem.

A further problem now exists. You cannot readily use discs because as soon as you try to save the program to disc the disc filing system will reclaim its memory and corrupt your program. The only way to counteract this is to enter the program at the normal PAGE value, save it to disc and then write a downloading program that will move the program down-memory automatically – Martin Phillips described the technique in the June issue (page 96).

If this does not work or you don't have a disc interface fitted, the only other alternative is to use a screen mode that requires less memory. For example, modes 4 and 5 need only half the memory required by mode 2. So try experimenting with different modes.

Q I'd always thought that the Beeb grew out of the Atom, but recently a friend told me that the Beeb came from the Proton. I've never heard of the Proton – what is or was it?

Adrian Frost
Fife

A In the beginning . . . the Proton was the name given to the machine that finally became the BBC micro. As you may have noticed while glancing through *Acorn User*, there is a lot in common between the Atom and Beeb Basics and indeed the BBC micro owes a lot to the Atom. The Proton, as originally envisaged, would have been without many of the features we all now know and love on the Beeb. The contract between the BBC and Acorn meant that the machine had, for instance, to be able to provide teletext type – thus, Acorn had to go away with its Proton and design mode 7 onto a chip.

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Problems with handling files

Sir, I am sending with this letter two programs, BPUT and BGET, which I am trying to make run. However, when I want to read the file, I get an error message. Could you please solve my problem?

Abdulla Shams
Dubai, UAE

Joe Telford replies:
Thank you for your letter, but unfortunately you do not explain why you are writing these programs, which would have helped me work out the best answers.

Your program 3 is logically correct, but I wonder if it does what you want, because all it does is place a single byte in the file. For example, if you entered:

shoes,12,13
socks,10,11
hats,9,100
carpets,2,144
99,0,0

the file would only contain:

&01,&02,&03,&04

because only line 40 sends anything to the file. You can see that line 40 only sends the bytes for the variable I.

I would prefer program 3b which is almost the same as yours, with a couple of additions. First, instead of GOTO, I use a REPEAT . . . UNTIL loop. Second, instead of M$,L,R, I use long names which are more meaningful. Finally, line 110 saves each set of information (each record) to the file.

Notice that I don't use BPUT, because for files of information with strings and numbers, PRINT# is more useful.

Now for your second listing (program 4). Unfortunately, it does not operate correctly. Looking at line 50 and 60 shows that you seem to be expecting all the information saved in program 3 to be brought back into the computer for use with lines 50 and 60. Line 40 cannot do this because program 3 does not save the information you wish to use (M$,L,R). Also, the information that it does save, the item number as a byte, is not being used in program 4.

Line 20 can be removed altogether and line 40 can be altered to say just:

40 I=BGET#B

but it still will not work properly.

Program 4b is one solution. This does the calculations with the data filed in program 3b. Again I have altered the program so that the short variables have been lengthened, eg 'M$' becomes 'itemname$'.

I have removed the GOTOs and replaced them with REPEAT . . . UNTIL loops. When I used the two programs to make a short file, the final result looked like figure 1, although it could be put into columns using the TAB command several times in line 70.

```
ITEM1  ACORN USERS 243x1= 243
ITEM2  EPROMS 339x8= 2712
ITEM3  MONITORS 24x98= 2352
ITEM4  RESISTORS 1420x3E-2= 42.6
ITEM5  TRANSISTORS 543x0.12= 65.16
ITEM6  LOUDSPEAKERS 12x0.72= 8.64
```
Figure 1.

Long search for school software

Sir, I have owned a BBC B for over a year and have recently upgraded to OS1.2 and Wordwise (such a useful tool). There is, however, one thing that really puzzles me. For a machine almost perfectly suited to educational use, why is there such a shortage of good educational software?

I have seen quite a few programs in magazines which purport to be educational, but on further investigation most are poor indeed. I have two sons aged eight and 10 and we have gathered a collection of programs that are based directly on work they are doing at school.

Could you tell me why the programs made available to schools by MEP, CET and MUSE, etc, are not readily available for sale, so that interested parents could purchase them?

I ask myself though, could it have something to do with profit margins? By that I mean programs that education authorities are being charged a lot of money for would simply not sell for such prices on the open market. I find myself wondering if Sir Clive Sinclair's latest idea of releasing them to the marketplace is going to catch on. I for one certainly hope so.

R Hughes
Essex

Adventure query

Sir, Much has been written on the subject of misleading cassette packaging and advertisements, as the game is often nothing like the fancy pictures and exciting description.

There does seem to be a perfectly logical answer: print a screen shot of the game on the pack, and also in any adverts, as many companies already do. But what about text adventures?

When you consider that an adventure can easily have 2,000 different 'screens', it would be quite a daunting task to try and represent them on a wall, let alone a tiny cassette inlay. Therefore, what other methods are there of displaying just how marvellous this piece of software is?

Frankly, I don't know the answer, but it would be interesting to hear from readers.

Simon Clarke
International Adventure Club
10 Ennis Close,
Harpenden, Herts AL5 1SS
Prestel Mailbox: 582768663

```
10 A=OPENOUT"CIC":I=0
20 INPUT"ENTER NAME OF GOODS,QUANTITY,PRICE";M$,L,R
30 IF M$="99" THEN 60
40 I=I+1:BPUT#A,I
50 GOTO20
60 CLOSE#A
```
Program 3. BPUT from Abdulla Shams

```
10 B=OPENIN"CIC"
20 I=0
30 IF EOF#B=-1 THEN 80
40 I=I+1:I=BGET#B
50 LET H=L*R
60 PRINT M$;" ";L;"x";R;"= "H
70 GOTO40
80 CLOSE#B
```
Program 4. BGET from Abdulla Shams

```
 10 A=OPENOUT"CIC"
 20 number=0
 30 REPEAT
 40  number=number+1
 50  PRINT "ITEM:"number
 60  INPUT"ENTER NAME OF GOODS   :"itemname$
 70  IFitemname$="99" CLOSE#A:CLS:END
 80  INPUT"ENTER QUANTITY        :"quantity
 90  INPUT"ENTER PRICE           :"price
100  PRINT
110  PRINT#A,itemname$,quantity,price
120 UNTIL FALSE
```
Program 3b. Joe Telford's version

```
10 B=OPENIN"CIC"
20 itemno=0
30 REPEAT
40  itemno=itemno+1
50  INPUT#B,itemname$,quantity,price
60  LET total=quantity*price
70  PRINT"ITEM";itemno;" "itemname$;"
     ";quantity;"x";price;"= "total
80 UNTIL EOF#B
90 CLOSE#B
```
Program 4b. By Joe Telford

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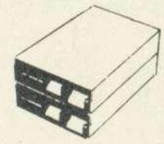
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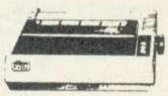
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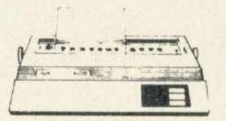
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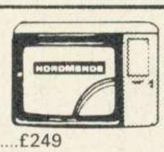
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Spanish accents with Wordwise

Sir, We have been using the *Wordwise* text editor and have found ways to print correctly every oddity of the Spanish alphabet, without recourse to external software.

Wordwise permits the passing of control codes to the printer, and the most tricky point was to add accents without disturbing justification as they have to be placed on top of a vowel. Therefore, a backspace control code has to be sent to the printer after each accent. *Wordwise* ignores, at the time of calculating the justification, any control codes meant for the printer. So one space is deducted by the printer to every justified line per each backspace instruction.

A simple but not so obvious solution is to send to the printer, as a first parameter of the 'OC' (output control code) together with the back space, something that compensates it: the ASCII code for the accent itself! So both the accent and back space are ignored by the justification routine, but recognised and printed correctly by the printer. The ASCII code of the accent prints the symbol and advances one space which is compensated by the backspace. Therefore, lines with accents remain correctly justified.

We could provide anyone interested with different sets of programs for the user defined keys. Spanish characters can be called on my Epson MX80 F/T III by typing <OC27,82,7> at the beginning of the script.

We are now starting to use *View*, which we find more convenient for certain jobs, but do not know how to send instructions to the printer. Can anyone tell us how to write correct Spanish with *View* and the mentioned Epson printer? Thanks in advance.

I Beng
BBC Micro Club,
PO Box 1297,
Santa Cruz de Tenerife,
Spain

Suicide theory

Sir, Why doesn't Acornsoft do something really useful instead of producing even more silly games (like *JCB Digger*)?

How about Basic 3, which has all the bugs fixed (as in Hi-Basic for the 6502 second processor).

And a new DFS that allowed more than the ridiculous 31 files, could copy a file onto the same disc (by giving it a new name), and rename 'fred' to 'FRED' would be really useful. It would be even more useful if it could save a file as a number of separate linked blocks across a disc, instead of as one continuous block. The current system must be the cause of 20 per cent of all suicides in this country. When you try and extend a 250-byte file by 10 bytes and the DFS produces a 'Can't extend' message with 190000 bytes free on a disc, you wonder why we don't all give up and return to the trees. (Even the good old fashioned Pet 2040 disc drives could do these things).

And how about *VIEW to enter *View* (instead of, or as well as *WORD)? A way to stop a blank line being printed before and after every page, and a way to count lines, or find where a page ends would be useful. It would also be nice if *View* informed the printer driver whether SHEETS or PRINT was being used (so it could turn off the paper end detector or even select printers), and a command to extract the name and address from a file and print it on its own (for the envelope) would probably save a few hundred man years' work across the country.

The list goes on and on, and while much of the Acornsoft software is good there are omissions which wouldn't be too difficult to include.

Paul Skirrow
Derby

Chess solution

Sir, With reference to Duncan Miles's letter (September 1984), in which he recommends Computer Concepts' Chess 2.32, your readers may be interested to know that Computer Concepts have dropped their cassette programs to concentrate on ROMs.

However, a slightly improved version (Chess 2.32/1 Version H/E-1) is now available, for the BBC and Electron, from Superior Software for £7.95.

David Thompson
(author of Chess 2.32)
London

Torch journal

Sir, You were kind enough to publish my letter in the February issue of *Acorn User*, which informed your readers of the setting up of the Torch User Group.

I am pleased to say that as a consequence of the large number of replies, we have just published the first issue of the group's journal. The result of this one letter has been a response from several countries round the world. I am still receiving enquiries which refer to that letter of six months ago!

For the benefit of new readers, may I repeat that enquiries about the one and only Torch group should be addressed to me at: 69 The Avenue, Wembley, Middlesex HA9 9PH. An SAE will result in heartfelt thanks and a speedy response.

Grahame Perchick
Torch User Group

Basic addresses

Sir, I should like to reply to a letter from Neil Howard of Herts, published in September's *Acorn User*. Neil asks for addresses in the BBC Basic ROM.

Cambridge Microcomputer Centre has published a book entitled *The Advanced Basic ROM User Guide* which meets this requirement exactly. If Neil cares to ring (0223) 355404, I am sure they will be happy to supply.

C Pharo
Cheshire

The book costs £7.95 (plus £1 post) from CMC at 153 East Rd, Cambridge.

Fox logic

Sir, G Swain, in your September Letters column, described how his computer is acting as a 'program generator', listing all possible combinations, in order to establish copyright on all programs not yet written (presumably simultaneously rewriting the complete works of Shakespeare, in both ASCII and teleprinter codes, in several different languages).

I feel I should warn Mr Swain, however, that he may be heading for legal difficulties. Some of his listings will undoubtedly begin with the string 'REM (C) Martyn Fox'. If he attempts to give away permission to copy those programs, I shall sue.

Martyn Fox
Windsor

Handicap database

Sir, We are establishing a database of software for the handicapped – Bardsoft. Briefly, each entry will contain a description of the programs, the handicaps they are suitable for, the type of computer system required, name and address of supplier/developer and price, etc. This information will be made available through printouts in answer to specific enquiries.

The aim of Bardsoft will be to facilitate the exchange of information on software relevant to any aspect of the lives of handicapped people. One major addition will be the concerted effort to promote the database, and therefore the software, abroad.

As we are currently collecting and processing information, we would be pleased to hear from any of your readership who may wish to contribute to Bardsoft. For further information please contact me at Handicapped Persons Research Unit, Newcastle-upon-Tyne Polytechnic, 1 Coach Lane, Coach Lane Campus, NE7 7TW. Tel: (0632) 664061.

Peter Curran

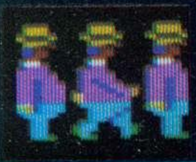
Software search

Sir, Schools in NSW Australia have in the last year begun to use the BBC micro. As we are only in the early stages of BBC use we are suffering from a lack of public domain (ie free) software. We would appreciate any help from readers who could advise us as to where we could obtain this software. Our address is: Trinity Grammar Preparatory School, 125 The Boulevarde, Strathfield, Australia 2135.

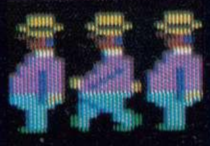
Richard Walker

ASK a silly question, pass a fair comment, stage an angry protest – we don't mind what you write to us about (or about us!). Keep 'em short, keep 'em sweet, but keep 'em coming! The address is: Letters, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

MIRROR AND



CLONE



In the concluding part of his sprite generator series, Harry Sinclair shows some fancy tricks

ME and my big mouth. I said that adding extra facilities to the *Design* program (September issue) would be fairly simple. So it proved to be. The difficult bit was getting it all to run without the machine complaining there was no room. I spent ages writing quite a complicated bit in Basic and had to write it all again in assembler to cram it in. Then I ran out of room for any more machine code. My kingdom for a second processor.

However, I didn't work in a sardine canning factory for nothing – I got all the sardines I could wear. I've managed to concertina it enough, although the screen messages are a bit cryptic in parts, and all notions of 'meaningful' variable and procedure names have taken some cosh. Nonetheless – and that's the sort of word that a man who's had to write in a language consisting of 'ig', 'og', and 'ug' for some time is prone to use – the program now offers all the promised facilities. You can edit previously designed sprites, clone (ie, create a copy of a design shifted one pixel to the right), generate mirror images, or design new sprites. The program is now menu-driven, as am I, so you can hop from one course to another and then go back if you want.

To create the space for the new procedures, PROCassemble has been removed. This, with additions, is run separately once to generate the object code and is then of no further use.

I've tried to keep the number of other changes to a minimum, but naturally one or two things have had to be moved about. Essentially, I've changed the start of the program, removed the assembler part and tacked on the new procedures at the end.

The workings of the new parts are fairly simple. Let's start with mirror images. In this program the image reversal is round the Y axis, so if you have a sprite man facing right, the mirror image would show him facing left. This means that you have to deal with the data in rows across the screen. The rightmost byte will become the leftmost and vice-versa. In addition, the pixels within the bytes will have to be reversed – if the rightmost byte was red/green, the new leftmost byte will become green/red.

Once you have designed a sprite, this sort of manipulation is quite easy. Say you have a sprite that is eight pixels wide (four bytes in mode 2). If you remember my descriptions of screen layout in parts 1 and 2 (September/October), you will know that the four bytes forming the top row of the sprite are offset from the start position by 0, 8, 16 and 24 bytes respectively. What you have to do is reverse the colour information within each byte and then move the data in byte 0 to byte 24, the data in byte 8 to byte 16, and vice-versa.

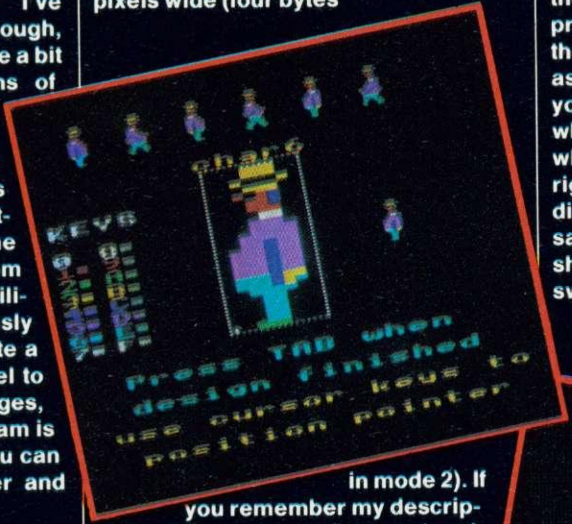
Writing a loop to access all the bytes in a sprite can make you walk with a bit of a limp, but the colour reversal is achieved quite easily by employing another of those very useful logical operators, AND. All this does is a straight comparison, bit by bit, of two numbers. For example, if you have the numbers 182 and 93 (decimal), they are 10110110 and 01011101 in binary. The operator AND compares them digit by digit and if both digits in each pair are set to 1, the corresponding digit in the result is set to 1, otherwise it is set to 0. So, in this case the comparison would look like this:

```
     182 = 10110110
    AND
      93 = 01011101
  RESULT = 00010100 = 20
```

The results aren't really meaningful as quantities. ANDing is used to mask out specific bits in a byte. The colour information in a mode 2 byte is arranged in a particular way. The odd bits, starting at bit 7 and going down to bit 1, give the colour number of the left-hand pixel; and the even number bits 6 to 0 give the right-hand colour number. Bit 7 is the leftmost bit when the number is written down. So if you AND a byte with &AA – 10101010 in binary – you will mask out all the right-hand colour information. ANDing with &55 – 01010101 in binary – will delete the left-hand colour information. Pretty useful, eh?

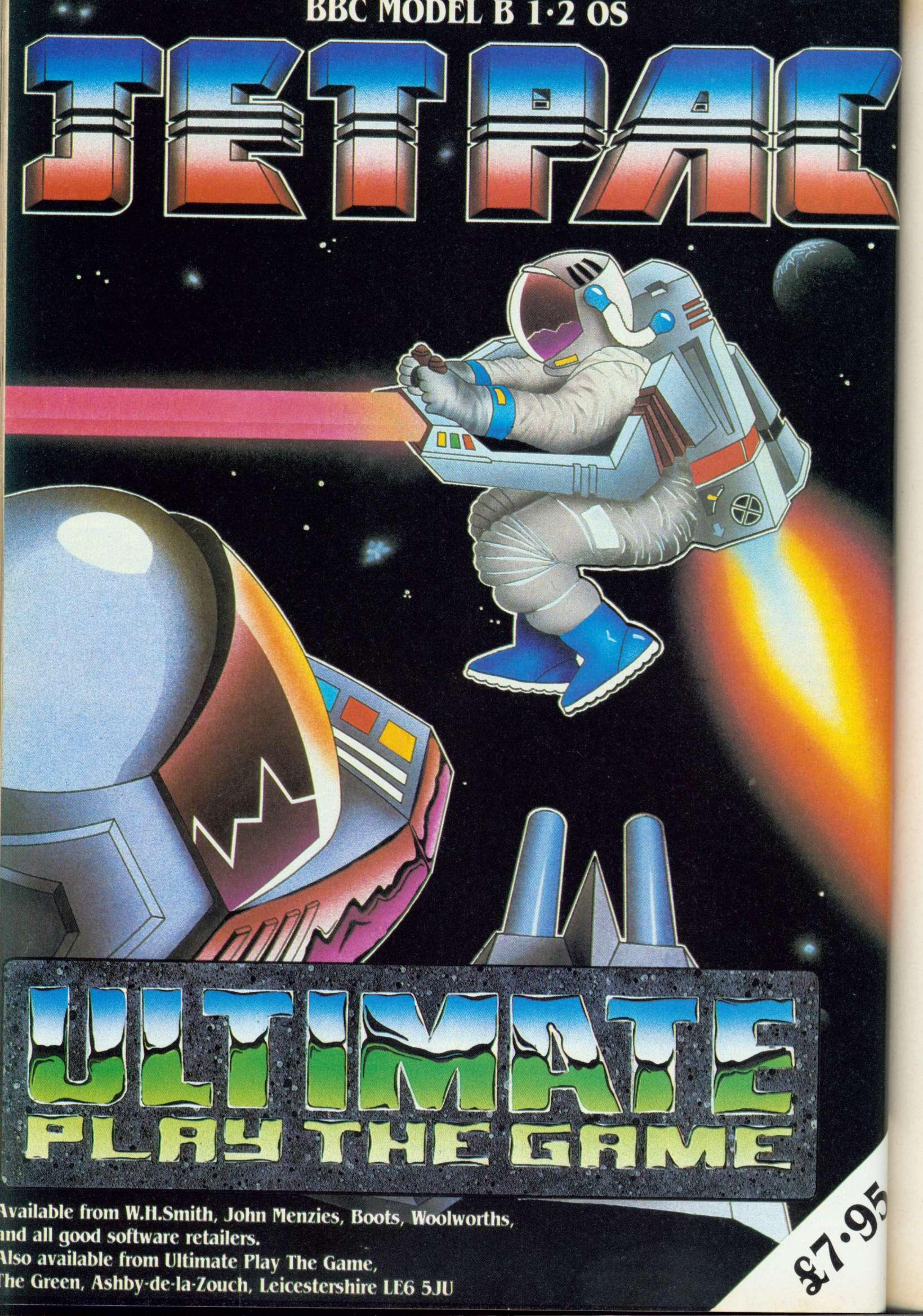
Once you've masked out the bits you're not interested in you can shift the remaining ones over one position to provide the new colour information for the other pixel. Shifting is easy in assembler (it's about all that is), where you have the instructions ROL and ASL which both shift left, and ROR and LSR which both shift right. Since shifting right one binary place is the same as dividing by two, and shifting left is the same as multiplying by two, it's easy to show in Basic how to perform colour swaps.

If you type in the small demo (listing





Once you have designed a sprite, manipulating it is quite easy


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```
10 MODE2
20 C%=&4C80:           REM arbitrary screen location
30 ?C%=&57:            REM flashing b/w and red
40 A%=?C% AND &AA:     REM mask out r/hand colour
50 A%=A%/2:            REM shift right
60 B%=?C% AND &55:     REM mask out l/hand colour
70 B%=B%*2:            REM shift left
80 newbyte=A%+B%:      REM put them both together
90 C%?16=newbyte:      REM write the new combination to the screen
```

Listing 1. Running this demo program displays two bytes on the screen

1) and run it you will see two bytes displayed on the screen. The first one is flashing black/white and red, and the second one has the colours reversed.

If you want to know how the colour numbers are arrived at in the first place, see my article in the September issue – it's easy.

The mirroring process is carried out on the first four sprites in memory, sprites 0 to 3, and the results are put into the data areas for sprites 4 to 7. If you design the cartoon frames for a sprite moving left to right, for instance,. selecting the mirror option will produce exact copies but with the sprite moving right to left.

Cloning is similar to mirroring except



that the intention is to make a copy of a sprite but with the pixels moved one position to the right. The idea is that you can then alternate the two designs and make your character move across the screen very smoothly, since it will be moving in steps of one pixel rather than two. It also moves at half the speed, of course, all other things being equal.

The difference with cloning is that instead of just changing colour positions within a byte, the right-hand pixel data in one byte has to be moved into the left-hand pixel position of the next byte horizontally. Again, the operator AND comes to the rescue and the process itself is not difficult, although writing the loop controlling it caused a dull throbbing in my ankles. This intensified when the 'no room' message turned up. Rewriting it in assembler was actually a pleasure – the logic is so much simpler and clearer.

The clone procedure operates on one sprite at a time, putting the clone data into the next sprite position. This imposes limitations, since the program works out where the next sprite data position is by using the address table. The way things are set up, sprite 2 has the same address as sprite 0, and sprites 4 and 6 are similarly afflicted. The result is that an attempt to clone sprite 1 will bung the new data into the area used by sprites 2 and 0. However, since it's unlikely that you will be wanting to use multi-frame animation and pixel-by-pixel movement at the same time, this should not prove problematic.

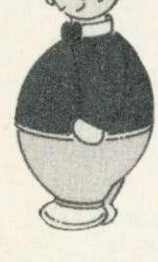
The cloning procedure also carries out an important check. For the sprite to be moved over there must be enough room on the right-hand side of his 'data box'. If you want to make clones, ensure that the original design has at least one pixel free (ie, black) all the way down the right side. The world won't end if you don't – you will just get a message telling you it can't be done. In fact, it could be done but you don't want crucial bits falling off the right side of your sprites.

Using the final program is just a matter of picking a number from the menu, as in a Chinese takeaway. You are offered five options. The first three are concerned with existing designs – EDIT, CLONE, MIRROR. You will be asked if the designs are already in memory and, if not, what the sprite file is called. Inserting the correct disc or tape and pressing Return will then load the data and carry out the appropriate procedure. In the case of EDIT and CLONE you will be asked for the number of the sprite first. Of these first three options, only EDIT causes you to enter the editor – the other two just do their thing and tell you when they've finished. If you want to have a look at their handiwork, use EDIT afterwards.

Option 4 allows you to design new sprites. It differs from EDIT in that it clears the data and address areas and asks you how wide you want the sprites to be. You can use the editor to design new sprites but their width is fixed at that of the sprites already in memory. Selecting 4 is rather drastic since it destroys whatever designs you may have had in memory at the time.

Finally, option 5 allows you to save your designs. It checks through memory to see how many designs you have made, where they are, and then displays the information. You are asked if you want to save the sprite data, and if so, what you want to call it. Saving, like loading, is automatic.

Instructions for modifying the original *Design* program and creating the machine code, together with the listing for the new bits are on yellow pages 103 to 107.



The final version of Design is listed, together with full instructions, on yellow pages 103-107

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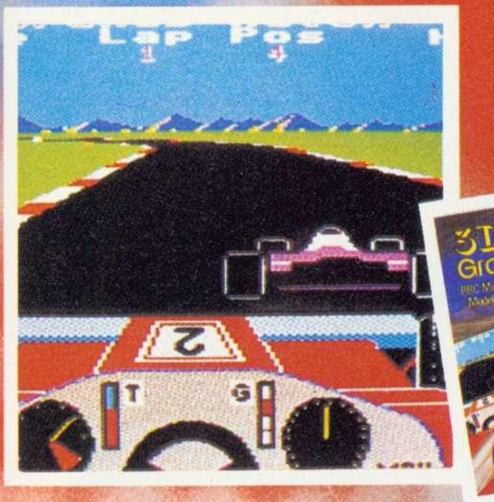
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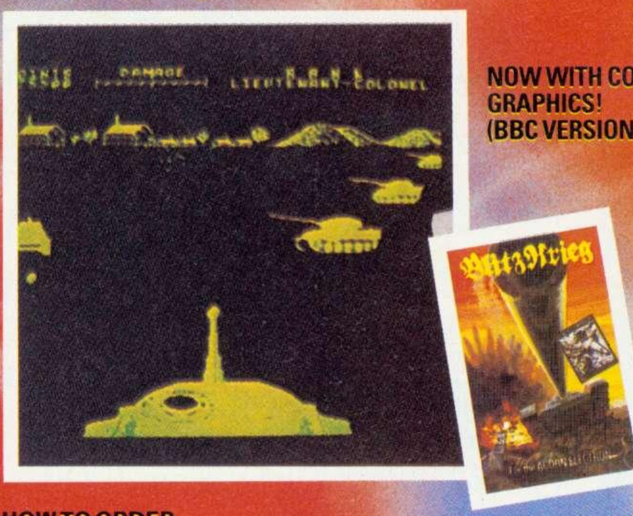
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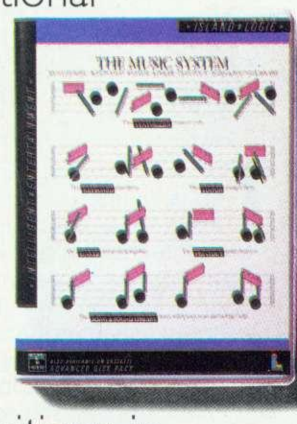
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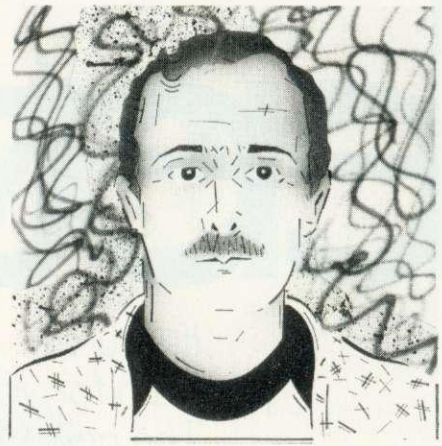
To Ludwig the prospect of music composition by the masses must make him turn in his grave.

But to us the prospect is heartening. Mr Beethoven, as you decompose, we compose.

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In recent months letters have been flowing into the *Acorn User* office asking for articles covering the more esoteric details of assembler such as floating point variables and trigonometric functions such as cosines, sines and drawing of machine code circles. We hope to provide the answers to most of your points in a series of articles, starting in this issue with an examination of how floating point numbers are stored within the Beeb. Program examples demonstrate the use of some ROM-based routines.



FOLLOW THE FLOATING POINT

Bruce Smith introduces a new series designed to help you learn assembly language without tears

THE term 'floating point' is applied to a numeric value that may acquire a fractional part, expressed in decimal terms with figures to the right of a decimal point – for example, 123.456. The Beeb's Basic interpreter assumes that any variable it encounters is a floating point value unless a % or $ sign appears immediately after the variable name. The % denotes an integer or whole number value, while the $ denotes an ASCII string variable. It is important to remember that a floating point variable may still hold a whole or integer value, thus the two assignments

```
FIRST=123.456
SECOND=123
```

both assign values to floating point variables even though the latter is an integer.

In BBC Basic floating point variables have what is known as 10-digit precision, displayed with nine digits and an 'exponent' in the range +37 to –38. The exponent of a number is simply a scientific notational form of representing numbers. For example, the number 123.456 could be expressed notationally as:

0.123456E+3

The E denotes an exponential value and the +3 the fact that the decimal point has moved three places to the left. Converting an exponentially represented value back to its normal form simply requires moving the decimal point the number of places to the right specified by the exponent. The value:

0.567345E+5

reverts to:

56734.5

Another, more common way of expressing an exponential value is to use a 10 and add a superscript to this to provide the exponent. Our first example could be expressed as:

$0.123456*10^3$.

Similarly, the decimal value 0.000123 can be written as 0.123E-3 or $0.123*10^{-3}$, the –3 indicating that the decimal point must be moved three places right in a negative direction to restore its original representation.

Representing an integer value in both binary and decimal format is straightforward. Consider the value 128.125. In binary the entire value would be represented by:

10000000.0010

The binary value to the left of the binary point – or 10000000, is 128, where only bit 7 is set and this has a weight of 2*2*2*2*2*2*2, or 128. The weight of values to the right of a binary point are progressively halved, thus the weights of the first four fractions would be:

0.5 0.25 0.125 0.0625

All we need do is to make up the value of the decimal 'fraction' of the number by setting and clearing the correct sequence of bits. As an example, to represent 0.125 we need only to set one bit, in this case .001. Consider the decimal value 15.625. The 15 converts to 1111 binary and the 0.625 part can be defined as .5 plus .125, thus the binary 'fraction' is .101 (figure 1). Thus 15.625 produces a binary value of 1111.101.

.625=.5+.125

	.5	.25	.125
.	1	0	1

Figure 1. Calculating the 'binary' fraction of a number

As with decimal values, binary numbers can be manipulated to make them easier to handle and less memory-hungry by converting them to two components, in this instance the binary exponent and the binary mantissa (the mantissa is the number portion of a value). Figure 2 shows hov these sections could be arranged in memory using six bytes per number. The sixth byte here is required to hold the sign (positive or negative) of the number – in fact, only a single bit need be used (bit 7), as 0 and 1 can denote a positive and negative mantissa respectively. The binary exponent occupies just a single byte and this is used to represent both positive and negative values by adding the value to

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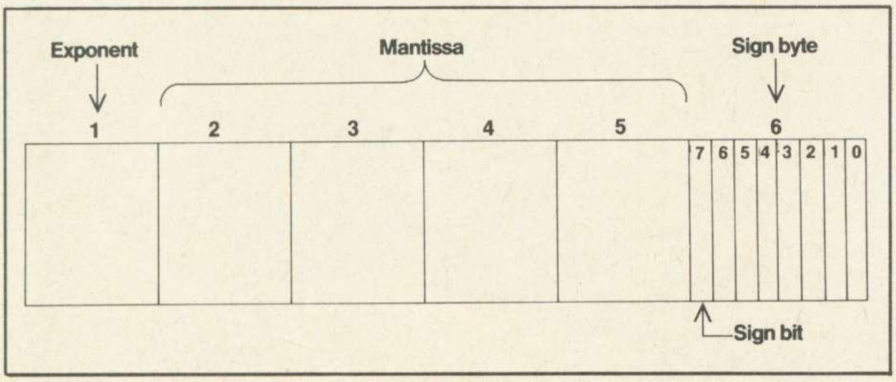


Figure 2. How the binary exponent and mantissa and sign bit are arranged in memory

◀ *page 74*

or subtracting it from 128. For example, an exponent value of +15 is represented by:

+15 = 128 + 15 = 143

whereas a negative exponent of –15 is expressed as:

–15 = 128 – 15 = 113

To save memory and improve handling of the floating point values the Basic interpreter 'normalises' them. This process involves shifting the bits along until a 1 is encountered at the most significant bit's position.

Consider the hexadecimal value &345. Converting this to its two-byte binary representation gives:

&345 = 00000011 01000101

Because we are now working to a base or radix of two the exponent itself becomes two, so transformed exactly as it stands the above binary value could be read as:

00000011 01000101 * 2^0

Now to normalise this value we need to 'float' the binary point along to the left until it sits directly in front of the leftmost 1. Figure 3 illustrates the movement of the point through the binary number. To calculate the final exponential value we first need to count the number of characters the point has floated along to the left – in this case 10. Thus:

&345 = 0.11010001 01000000 * 2^{10}

The final byte has been padded out with noughts to keep the two bytes distinguishable. As the number has a positive value 128 must be added to it to obtain the final exponential form:

10 + 128 = 138 = &8A

Now we need to manipulate the mantissa. This uses four bytes, two of which we already have, the remaining two bytes being padded out with zeroes to give:

11010001 01000000 00000000 00000000

To complete the normalisation we must indicate a positive value by placing a zero into bit 7 of the sign byte. The complete representation of &345 in floating point is therefore:

Sign	0xxx xxxx	
Exponent	1000 1010	&8A
Mantissa	1101 0001	&D1
	0100 0000	&40
	0000 0000	&00
	0000 0000	&00

The *x*'s in the sign bit may have any value.

The above example uses a whole number, with no decimal 'fraction', but the technique to normalise a truly decimal value is the same. For example, the decimal value 241.75 can be expressed in binary as:

1111 0001.11

Normalising this would give:

.11110001 11000000 00000000 00000000

with an exponential value of 128 + 8 = 136, or &88.

The above method of using a single byte of which just one bit holds the sign of a number is obviously wasteful of memory. Floating point numbers stored in memory use just five bytes – 40 bits for storage, which includes the sign bit. How is this done? You will remember that the Basic interpreter normalises a floating point value by moving the binary point along to the left until it reaches the leftmost 1. So it is a known fact that the first bit in the mantissa will *always* be a 1. As the Basic interpreter also knows this it can forget it and use the bit to represent the sign of the floating point value. When Basic needs to read the value of the number it can extract this sign bit, reset it to 1 and evaluate the number proper. Simple but very neat! In memory, then, the normalised representation of &345 is compacted into just five bytes of memory, stored thus:

Exponent	1000 1010	&8A
Mantissa	0101 0001	&51
	(*bit 7 = 0 – therefore positive*)	
	0100 0000	&40
	0000 0000	&00
	0000 0000	&00

Figure 4 shows a dump of the area of memory storing the one-liner:

10 float = &345

After running this program the variable contents are stored above the program, as illustrated from &1C17.

We have seen that floating point numbers can be stored in a compact five-byte form or a loose six-byte form. Both methods are used by the Beeb and Electron. Because memory is at a premium the five-byte packed form is used throughout by the Basic interpreter to store variable values above

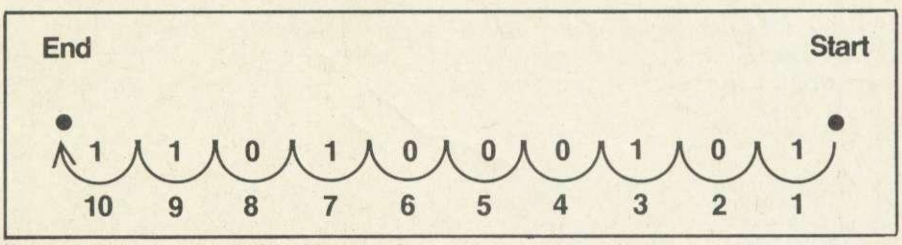


Figure 3. The movement of the binary point

```
L 1C00]1C1F
1C00 : 0D 00 0A 0E 66 6C 6F 61 ....floa
1C08 : 74 3D 26 33 34 35 0D FF t=&345..
1C10 : 00 00 6C 6F 61 74 00 8A ..loat..
1C18 : 51 40 00 00 00 00 00 00 Q@......
```

Figure 4. Dump showing how the floating point variable is stored

Bruce Smith's five floating point demonstration programs are listed on yellow pages 108 and 109

FUNCTION	ADDRESS FAC1	FAC2
sign	&2E	&3B
overflow	&2F	&3C
exponent	&30	&3D
mantissa hi.byte	&31	&3E
mantissa	&32	&3F
mantissa	&33	&40
mantissa lo.byte	&34	&41
Rounding	&35	&42

Figure 5. The eight bytes of the floating point accumulators

LABEL	BASIC I	BASIC II
MEMFAC1	&A3A6	&A3B5
FAC1MEM	&A37E	&A38D
FPADD	&A50E	&A500
FPSUB	&A50B	&A4FD
FPMULT	&A661	&A656
FPDIV	&A68B	&A6AD

Table 1. Basic 1 and 2 addresses for entry into subroutines

0	:	00	00	00	00	00
1	:	81	00	00	00	00
2	:	82	00	00	00	00
3	:	82	40	00	00	00
4	:	83	00	00	00	00
5	:	83	20	00	00	00
6	:	83	40	00	00	00
7	:	83	60	00	00	00
8	:	84	00	00	00	00
9	:	84	10	00	00	00
10	:	84	20	00	00	00

Table 2. Five-byte floating point format of the numbers 1 to 10

programs. However, the loose format is used in zero page by the interpreter as it makes the handling routines much simpler to code.

There are two areas in zero page associated with floating point manipulation. These are the floating point accumulators FAC1 and FAC2. Figure 5 shows that each FAC comprises eight bytes, with FAC1 addressed at &2E to &35 and FAC2 at &3B to &42. The extra three bytes are:

a. Sign byte: the most significant byte of the mantissa is copied here to give the sign byte, which is held in bit 7.

b. Overflow byte: used rather like the carry flag to hold any overflow from an addition or other operation so that errors of inaccuracy can be detected.

c. Rounding byte: adds extra precision to arithmetical manipulations.

In FAC1 format the representation of value &345 would be as follows:

Sign	0101 0001	&51
Overflow	0000 0000	&00
Exponent	1000 1010	&8A
Mantissa	0101 0001	&51
	0100 0000	&40
	0000 0000	&00
	0000 0000	&00
Rounding	0000 0000	&00

To be able to manipulate floating point numbers using built-in subroutines in the Basic ROM, the value must be placed into the FAC1 before calling a particular routine. We therefore need an algorithm to transform the five-byte format from memory (assuming we will be manipulating variables passed through running a Basic program) into an eight-byte form. Luckily there is such a routine in the Basic ROM to do just this, at &A3B2 in Basic 2 (&A3A3 in Basic 1). Program 1 provides a demonstration of its use.

To use the program the address of floating point value in five-byte format must be placed in the floating point vector (FLPTV) at &4B. The Basic program seeds this address, &4000, via the locations &70 and &71. The subroutine call in line 120 to MEMFAC1 can then be performed (note that Basic 1 users will need to alter the JSR address). The loop in lines 130 to 180 then transfers the FAC1 contents to a series of safer locations in zero page, from which they can be printed. The demo seeds &345 into these locations and the final loose FAC1 configuration is printed out.

The process of seeding addresses of five-byte format, memory-based values is fundamental to the remaining programs presented here. Make sure you understand the process before proceeding!

The coding involved in performing addition, subtraction, multiplication and division on floating point values can become complex, so rather than dazzle you with page after page of assembler, details of ROM-based subroutines to perform these processes are provided. However, the practice cannot really be considered good programming and it would be a shame if the Beeb and Electron were beset by the peekery pokery that has evolved around other micros.

Table 1 lists the four Basic 2 and Basic 1 addresses for entry into each of the subroutines mentioned above. Programs 2, 3, 4 and 5 demonstrate uses of each subroutine. Each program is essentially similiar. The assembler begins by performing MEMFAC1 as described above to transfer fp1 into FAC1. Before the arithmetical subroutine call is made FLPTV needs to be seeded with the address of the second floating point variable at fp2. Once the Basic ROM call has been performed the result will remain in FAC1. A final ROM-based call can then be performed to implement FAC1MEM. This takes the eight FAC1 bytes and condenses them into five-byte format, placing them at the address held in FLPTV.

Setting up the floating point variables is undertaken in the Basic part of the program. To make these demonstrations clearer table 2 contains the five-byte floating point format of the numbers 0 to 10. You'll notice from this table that the value 0 does not conform to the representation described earlier. Zero is simply 0 but takes five bytes. If you need some further hints on the function of each program, here's what each is doing:

Program 2: floating point addition of 1+9.

Program 3: floating point subtraction of 7–5.

Program 4: floating point multiplication of 3*3.

Program 5: floating point division of 3/2.

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Joe Telford tries Toad in the hole, talking chips, ROMs for a variety of types – and warns on things that stick in the Tube

SIDE DISHES

IN THIS issue we look at some of the goodies that have arrived on the doorstep of Telford Towers over the past months.

When the postperson left 'The Towers' he seemed to walk some two feet taller, for as well as a much-needed printer he had left three smaller parcels. These interested me greatly, especially when I deciphered two postmarks as Watford. One was badly smudged, but the package was small enough to be exciting. I opened it first.

Toad in the hole

The parcel was from Toad Educational Computing. I was surprised to find inside it a 28-pin DIL socket header, from which a twin ribbon cable travelled about 16 inches to a small printed circuit board (PCB). On the circuit board was a 28-pin DIL socket, and extra to the package was a 28-pin zero insertion force (ZIF) socket.

What could this be? A completely soft EPROM blowing package? The documentation revealed all. This intricate piece of socketry was actually a ROM extension socket, the idea being to extend one of the four sideways ROM sockets to the surface of the BBC micro. Once the addition has been made, ROM chips can be switched without opening the micro's casing.

The idea seemed good and in a temporary breadboard the system worked well, the only small problem being to make sure that ROMs were plugged in correctly. The documentation explained this point adequately, but it is really common sense. My problem was that I needed a hole on the external casing of the BBC micro for the socket to locate into. Toad suggested the 'ashtray'. This is shown in figure 1 and is the hacker's name for the keyboard hole for the voice synthesis extension unit. Unfortunately, my ashtray is filled with voice synthesis add-ons.

I spent a month with the Toad socket hanging limply out of the rear air vents, before deciding that I needed to use it so frequently that it would have to be mounted permanently. The logical places were:

Front of keyboard below Delete and Copy.
Rear of machine on the back panel.
RHS casing above the memory chips.
LHS casing in front of PSU.
Top surface of casing.

Every place had a drawback, and all the choices meant cutting the BBC micro casing. I eventually decided on the left-hand side of the casing. This was the only spot that would be inconspicuous and yet allow machine expansion. Using the right-hand side would prevent easy use of second processors; the rear might be upgraded to Econet eventually; the top casing often had documents on it; and the front keyboard necessitated a complicated cutting and wiring job.

There's a well in front of the PSU inside the micro into which the Toad socket almost fits. To ensure the fit, I cut the PCB board along its length and width until it fitted the space with the keyboard in place. Next a cutout for the 28pin socket was made. This needed a fine hacksaw and resulted in a deep cutout in the BBC micro's lower casing and a small cutout in the lid (figure 2). Using the adhesive pads supplied by Toad, I then fastened the PCB to the inside casing with just the DIL socket visible. Once this was fastened securely I plugged in the ZIF. This was larger than the cutout, so ragged edges didn't show. The ribbon cable was lead to a sideways ROM socket along the underside of the keyboard.

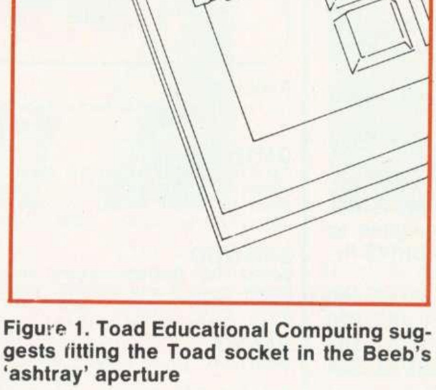


Figure 1. Toad Educational Computing suggests fitting the Toad socket in the Beeb's 'ashtray' aperture

Toad ROM extension socket: £19.95 from Toad Educational Computing, 8 Westbourne Grove, Sale, Cheshire.

Speech Synthesiser: £44 from Watford Electronics, 33–35 Cardiff Road, Watford, Herts.

Beebfont: £39 from Watford Electronics, as above.

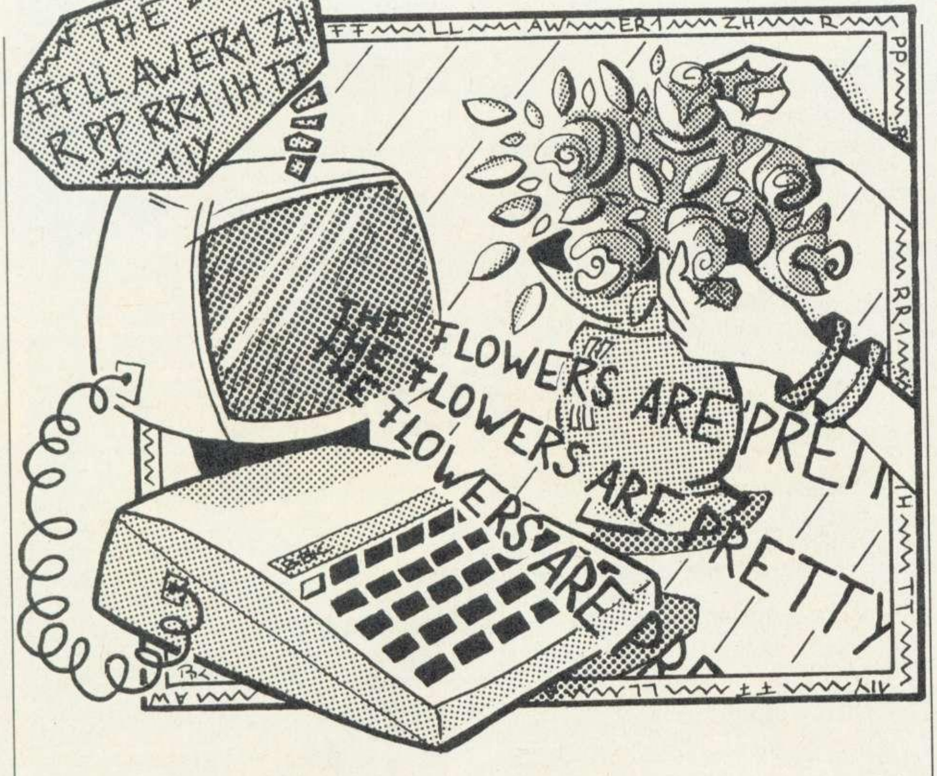
The Toad socket has now been in use for nearly four months and has proved very reliable. I use it to supplement a full ATPL sidewise board. Most of my ROM reviews are performed using it, and ROMs only move onto the main board if they are regularly in the Toad socket.

Although I use the socket regularly and am happy to customise my BBC micro, I would remind users that cutting the casing can void your warranty on the computer and reduce its resale value.

Talking chips

One of the other parcels that arrived at the Towers was from Watford Electronics. First out of the parcel and first examined for your edification was the WE Speech Synthesiser. This is a combined package based around a hardware synthesiser, with a driving ROM plus documentation.

The documentation is a detailed 20-page instruction booklet. It explains



that the WESS is allophone-based. This means that words are made up from components parts, for example we would say *COMPUTER* by transmitting the phrase parts:

KK3 AA MM PP YY1 UW2 TT1 ER1

This would pronounce the word correctly.

The benefit of using the WESS is that the method of sending these allophones to the device is simplified by the supporting software.

With the BBC micro switched off, insert the 'TALK' ROM into a sideways ROM socket. Plug the WESS into the user port and switch on the BBC micro. The WESS has a volume control and a reset button, as well as an 'Audio Out' jack socket. The WESS is set up by typing *HELP. This indicates that the ROM is correctly installed by producing a printed message:

Watford Electronics Speech Software

and a spoken message: 'Watford Electronics Speech Synthesiser'.

The unit can occasionally become confused, especially if any other interrupt driven software is in operation. This may result in abnormal silences or in hanging allophones (as in AARRGH!!!!). The Reset button will reset the unit, but the software has to be reset by typing *HELP.

The software for the WESS is quite sophisticated, as it enables users to *say* words using the *TALK command. For example:

100 *TALK I M A COMPUTER

is an acceptable sentence because the words I M A and COMPUTER are all provided in a large ROM vocabulary. Many games-type phrases are included:

*TALK THIRD WAVE FIGHTER ATTACK

and

*TALK BOMB THE SPACE INVADER

Less aggressive phrases must be constructed from mixed words and allophones, for example:

*TALK THE FF LL AW ER1 ZH R PP RR1 IH TT1 IY

tells us that the flowers are pretty.

Information is also given on using the OSBYTE call associated to the WESS (*FX25) and OSWORD 25, which allow access to machine code. The SOUND command on the BBC micro reacts to:

SOUND 8192, X,Y,0

and behaves like the *FX25 command, except that the problem of variables in *FX commands is removed. The short routine below shows my own way round the problem using the OSCLI command, available to users of Basic 2:

```
10 REPEAT
20 INPUT "phrase: "phrase$
30 OSCLI ("TALK "+phrase$)
40 UNTIL 0
```

Information is also given as to how to extend the library of words, so that users could blow ROM libraries for their particular needs.

In comparison with the Acorn Voice Synthesiser, the voice quality of the WESS is poor. If, however, we compare the device with other similar synthesisers, it compares well.

What I liked about WESS was:

- The ease of use. From *TALK to SOUND 8192 the unit was easy to handle.
- The large library of preselected words (more than 500).
- The fact that it is interrupt driven, and this means that 'parallel' programming can take place.
- The useful volume from the amplifier.
- The interesting and useful documentation.
- The use of three levels of inflection.

What I didn't like was:

- The time taken to get used to understanding the words. Very careful programming was needed to make the words sound correct.
- The poor quality of hard consonants like B, P, D, K and G.
- The squeeky W sound.
- The strange pronunciation of words like THIS and THIRD which are sounded as DHIS and DHIRD respectively.
- Occasionally very long phrases lose synchronisation, but this can be recti-

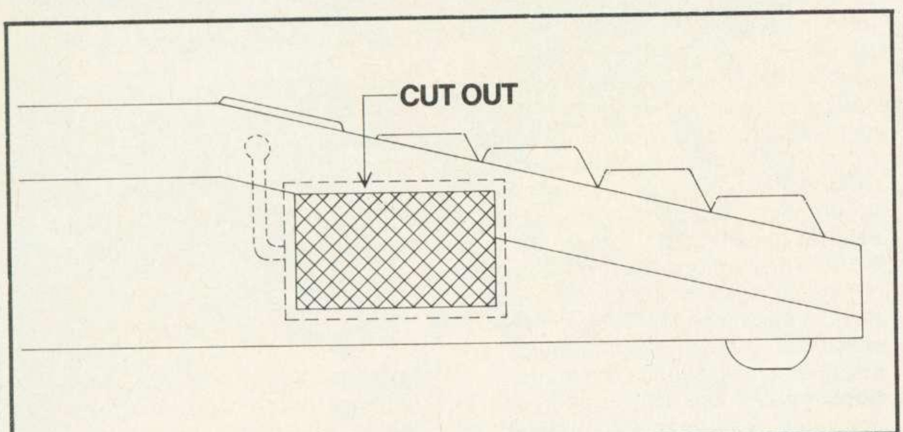


Figure 2. Joe's suggestion is to house the socket in a cutaway hole on the left-hand side (but you invalidate your warranty)

fied by splitting them into two or more lines of Basic.

Although the unit costs £44 it must be remembered that much of this is made up from the cost of the ROM chip, so the package represents reasonable value for money. Add to this the ease of programming and the wide vocabulary and the system has potential.

ROMs for changing faces

The third parcel opened contained a much smaller package, consisting only of a disc, manual and ROM. The manual showed eight ways of displaying the word *Beebfont*.

Beebfont is a utility ROM that allows users to access a number of different typefaces, including the BBC standard. Facilities available include:

- One ROMmed small typeface that can be altered as follows: emphasised; double height; double width; and double width and height.
- Five ROMmed large typefaces.
- One RAM-based small typeface that is user-definable.
- One RAM-based large typeface that is user-definable.

A typeface editor is also supplied with *Beebfont*. To complete the package a spooling program is included so that documents created by, say, spooling text can be printed out in large characters on a printer.

The typefaces must be accessed from modes 0, 1, 2, 4, or 5, as the other modes will provide gaps within large characters caused by the BBC computer's line-spacing.

Any typeface facility can be called by typing *FONT followed by CTRL-V then a number from 1 to 8. These refer to the ROM typefaces 1 to 6 and to the small and large RAM typefaces 7 and 8.

The typeface facility is turned off with *NOFONT. This can be done from within a program using lines like:

```
10 *FONT
20 VDU22,ASC("2")
30 PRINT "1 Typeface"
40 VDU22, ASC("4")
50 PRINT "And Another"
60 *NOFONT
```

The controllable typeface (FONT 1) can be selected by typing:

```
VDU22,ASC("1")
```

and any of the options – wide, tall, emphasised, normal – can be selected by issuing appropriate lines:

High	VDU22, ASC("H")
Wide	VDU22, ASC("W")
Emphasised	VDU22, ASC("E")
Normal	VDU22, ASC("N")

The various 'Beebfonts' are easily used for noticeboard messages, for OHP transparencies, or even for a change in programs.

The RAM-based typefaces can be altered with a utility program provided, called *Editor*. Although my version of the manual said I should:

```
CHAIN "B. EDITOR"
```

the program operated only on typing:

```
*EDITOR
```

The result is one of the best character editors I have seen. If graphics shapes are required it can even produce a 'character set of space invaders', all of which can then be saved to disc and brought back into the computer for use with *Beebfont*.

The editor is window driven, and three main areas appear: a large window containing the character sets in use; a half-size window that serves as the editing window for each character; and a command window that controls the movement of characters, loading, saving, switching between fonts, etc. This editor is a very impressive piece of work.

An additional facility allows text files like Wordwise documents to be printed out in any of the typefaces. Although the documentation indicates that a number of makes of printers can be used, the program on my disc was only for the Epson range.

The *Beebfont* ROM is very impressive. In fact I found it more impressive than useful. However, combined with a good wordprocessor and a spooling program to match a particular printer, it could be the basis of an introductory, low-cost electronic typesetting course for schools and colleges.

The cost: ah well, I suppose another 'world shortage of silicon' has produced the figure of £39.

Stuck in the Tube

It is becoming apparent that some ROMs don't work with second processors. What is less well known is that some ROMs partly work. Here is an introductory list of ROMs and their sticking points in the 6502 Tube.

DNFS chip Although useful in activating the Tube, the DNFS chip is less than helpful with some games programs. *Killer Gorilla* hangs up completely, and *Defender* crashes whenever a 'mutant' is created. *Snapper* and *Monsters* seem to run all right.

WESS The Watford Electronic Speech Synthesis system does not seem to work at all across the Tube to the 6502 processor. *TALK commands are accepted but no sounds are made.

Beebfont With the 6502 Tube in operation, this ROM can be enabled by *FONT. The result is that the computer hangs up, until a CTRL-BREAK is issued. *NOFONT also hangs up the computer, but often with accompanying noises. I presume the complex use that both WESS and *Beebfont* make of interrupts is the root of the trouble.

Wordwise and Wordwise B20 Neither of these ROMs works with the 6502 second processor. The B20 version of *Wordwise* will, however, work with the Aries board.

On calling *Wordwise* from the 6502 processor the first menu page appears correctly but the results of keypresses are unpredictable. The end result is a crash.

Beebcalc Amazement! The *Beebcalc* ROM from Computer Concepts can be called from the 6502 second processor and it works! Load/Save/Amend/ and all the worksheet commands I tried, including Printing, apparently operate correctly.

Caretaker Some of Computer Concepts' *Caretaker* commands work on the other end of the 6502 Tube. Generally the screen and keyboard I/O commands function well, though disc accesses are somewhat hazardous:

Working commands

*CURSOR ON
*CURSOR OFF
*NORMALKEY
*NOTAB
*SINGLEKEY
*TABSTOPS
*EXCHANGE

Non-working commands

*EXCHANGE
*INSERT
*KEYLOAD
*KEYSAVE
*LVAR
*MOVE
*MERGE
*PARTSAVE
*RENUMBER
*RETRIEVE
*SQUASH
*STATUS

These commands either behave erratically because of confusion over the memory map in which they are executing, or cause the system to hang up.

Over to you

If you have any ROMs working (or not) with a second processor, why not describe which facilities work and which don't. Send the information in *on a postcard* with a few lines saying:

Which ROM
Which processor
What works
What doesn't

Address your postcard to: Joe's Jottings, *Acorn User*, Redwood Publishing, 68 Long Acre, London WC2E 9JH. Don't forget to include your name and address.

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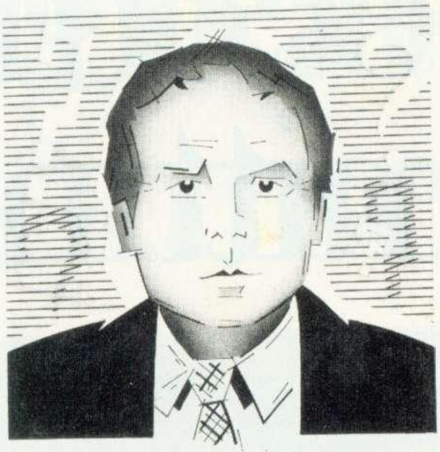
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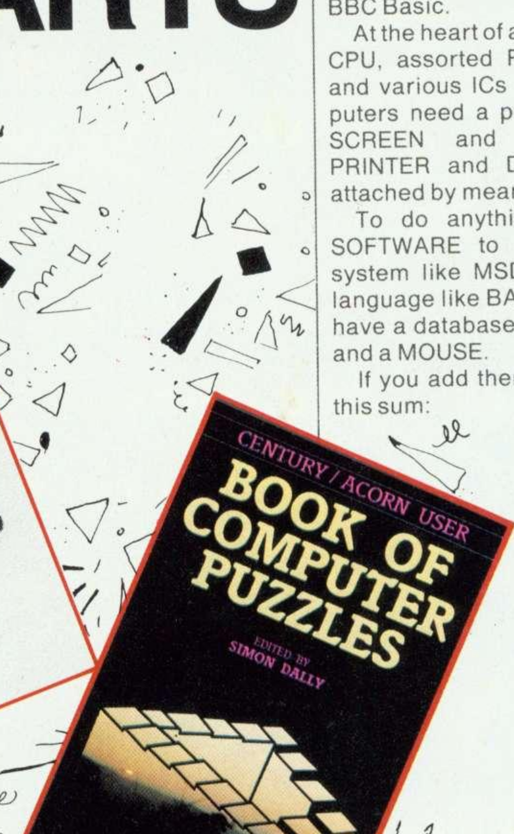


We've got five computer trollies to give away this month. Simon Dally presents a straightforward problem of adding up the add-ons

THE SUM OF ITS PARTS



Home computer trolley by Gallini



Out next week...

THIS month's problem was submitted for entry in the *Century/Acorn User Book of Computer Puzzles* (to be published on October 25 at £4.95) by Dave Stanford of Kinross, Tayside. Unfortunately Dave was unable to supply the solution on anything other than an Atom – and the rules did specify BBC Basic.

At the heart of a computer system is a CPU, assorted ROM and RAM chips and various ICs on the PCB. All computers need a power supply (PSU), a SCREEN and a KEYBOARD. A PRINTER and DISC UNIT are often attached by means of DIN plugs.

To do anything useful you need SOFTWARE to run it, an operating system like MSDOS and a high-level language like BASIC. It is also useful to have a database (DB), a MODEM UNIT and a MOUSE.

If you add them all together you get this sum:

```
     CPU
     ROM
     RAM
      IC
     PCB
     DIN
     PSU
  SCREEN
KEYBOARD
 PRINTER
    DISC
    UNIT
   MSDOS
   BASIC
      DB
   MODEM
    UNIT
   MOUSE
--------
COMPUTER
```

Each letter stands for a different digit and all digits are used. If you know that MOUSE + MOUSE = BASIC and that no carrying is involved, what does the sum look like?

Answers on a postcard please to arrive not later than December 7, 1984 to November Competition, *Acorn User*, 68 Long Acre, London WC2E 9JH.

Five computer desks worth £66 each, generously donated by Paul Gallini Enterprises await the first five correct entries out of the bag.

JUNE WINNERS

IT was obviously one of the easier ones, the June competition. About 600 of you entered it and nearly all of you got the answer right – SCS sold 277,199 and CC sold 637,559 machines. The winners were picked from a very large hat.

Ms B Wilson of London took the first prize, a Sidewise ROM board plus four ROMs (all from Computer Concepts); the two second prizes of three ROMs went to P Illingworth of Middlesbrough and Mrs S Mayne of Bromsgrove; and five third prizes of a ROM were won by Mr Finch of Brussels, Miss A J Kempster of Warwick, James Burt of Huntingdon, Zia Khadaroo of London, and Alan Shilling of Norwich.

All winners have been informed of their good fortune.

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It takes only two minutes and £59.80 to transform your BBC Micro into the heart of a word processor with VIEW from Acornsoft.

The VIEW word processing system is programmed into a single chip, a 16K plug-in ROM. Once it's installed into your BBC Micro – a simple job for your local dealer – you just switch on and VIEW is operating. (You can switch to other programs, like BASIC, with a single command.)

VIEW is a professional system, yet it's surprisingly straightforward to use.

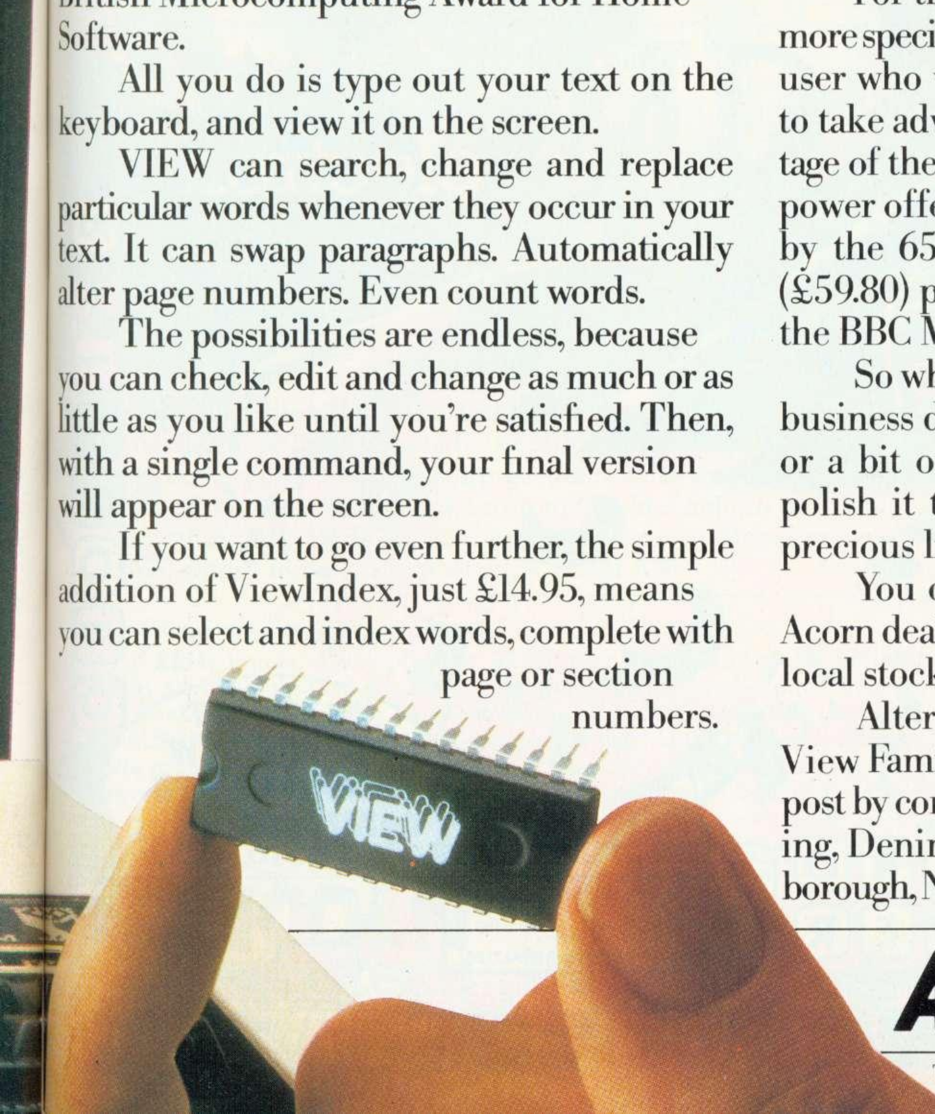
And it's so outstanding it's won the 1984 British Microcomputing Award for Home Software.

All you do is type out your text on the keyboard, and view it on the screen.

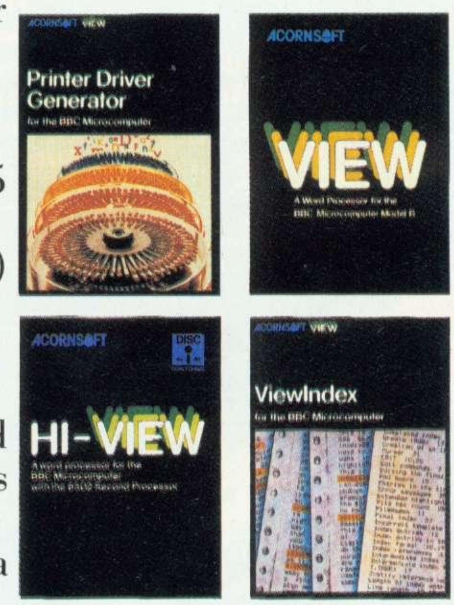
VIEW can search, change and replace particular words whenever they occur in your text. It can swap paragraphs. Automatically alter page numbers. Even count words.

The possibilities are endless, because you can check, edit and change as much or as little as you like until you're satisfied. Then, with a single command, your final version will appear on the screen.

If you want to go even further, the simple addition of ViewIndex, just £14.95, means you can select and index words, complete with page or section numbers.



And of course, when you're ready, any printer that will operate with your BBC Micro will operate with VIEW. But if you want to use the printer's special facilities, such as bold printing or underlining, Acornsoft's Printer Driver Generator (£9.95 on cassette, £11.50 on disc) enables you to do so.



For the more specialised user who wants to take advantage of the extra power offered by the 6502 Second Processor, Hi-VIEW (£59.80) provides 47K of text space in any of the BBC Micro's screen modes.

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You can get VIEW products from your Acorn dealer. Just phone 01-200 0200 for your local stockist.

Alternatively, you can send off for the View Family brochure and order through the post by contacting Acornsoft, c/o Vector Marketing, Denington Industrial Estate, Wellingborough, Northants NN8 2RL. Tel: 0933 79300.

ACORNSOFT

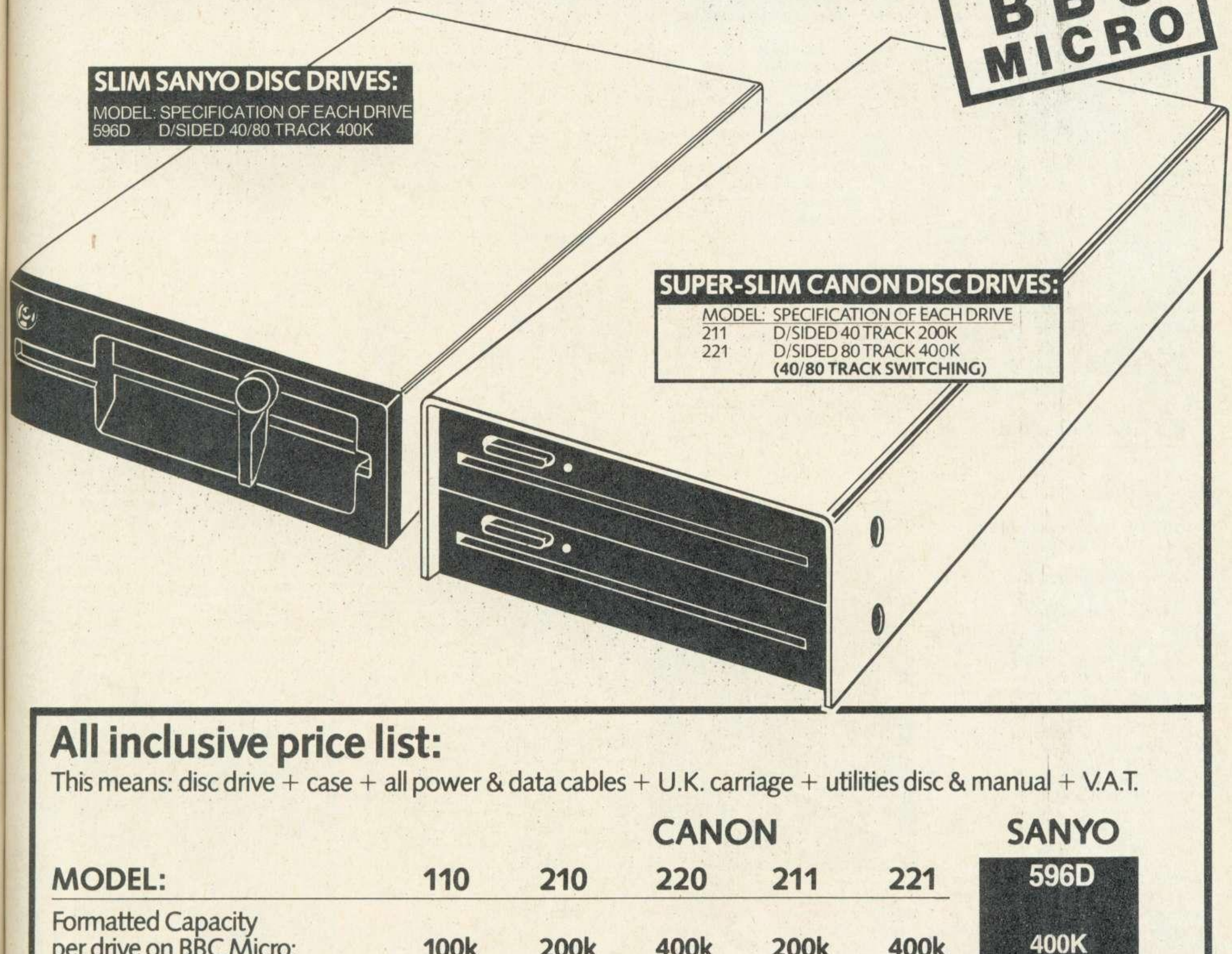
The text on the screen is in Mode 6.



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6. January 1983 MEP school launch. *FX commands for sound. Second BBC TV series. Machine code 3 – two pass assembly. Disc drives for the Beeb. Programming forum. Program protection. Micros in schools – new series. Commodore Pet printer used with Beeb. BBC programs written on an Atom. Extra Atom memory.



7. February 1 MHz bus examined (4). 3D Atom graphics (3). Atom BBC Board reviewed (3). Machine code 4 – memory (5). BBC Computer Literacy update (1). Atom error handling (2). Micros in schools 2 – getting organised (6). Hints and Tips (4). Beeb Forum (3). Reviews of *Wordwise* (2) and the Amber printer (1). ***

8. March Chess on the BBC micro (3). Sound on the Beeb (4). Printers for beginners (4). Atom analogue converter (2). Schools 3 – micros and maths (6). Machine code 5 – indirect addressing (3). DIY lightpen (5). MEP's *Microprimer* review (2). Atom Ross toolkit review (1). Beeb Forum (2). Assembly language and Pascal book reviews (2). ***

9. April *Hexangle* game listing (4). Bach on the Beeb (4). Hints & Tips on disc drives (4). Machine code 6 – the CALL statement (4). Interfacing the 1 MHz bus (3). Schools 4 – young children and micros (6). Graphics listings (2). Printers for beginners 2 (4). Reviews of BCPL, educational software and Atom software (3). ***

10. May Review of Basic II. Graphics listings. New *FX calls in OS1.2. Colour mixing on the Beeb. Jazz, blues and folk on the BBC. Schools 5 – language development. DIY Beeb interface box. Atom sound board. A to Z of printing: how to get going. Hints and Tips: PROCs, discs and FNs. Printer, software and book reviews.

11. June Techniques series – sorting. Hints and Tips: 50p network. Drawing techniques and CAD. Machine code: interrupts. Schools 6 – information technology. Atom Forum. Beeb Forum. Printers – write your own graphics dumps. Comparitive review of *View* and *Wordwise*. Three graphics packages reviewed. Test of *Acorn User*'s interface box.

12. July Techniques – hash tables. Hints and Tips: logic made easy. Recursion and graphics. Handling strings. Two ideas for passing variables. Beeb aids the blind. DIY second keyboard. Beeb Forum. Sounds on the Atom. Hardware, firmware, software and book reviews. Atom Forum.

13. August Printer graphics and dumps. Techniques – Tree structures and sorting. All the fun of the fair. 40/80 disc copier. Colour painting. Basic II: random access files. Screen dumps for Olivetti, Centronics and Seikosha. Atom strings. Reviews of Tandy CGP115 printer, five educational packs, A to D converter.

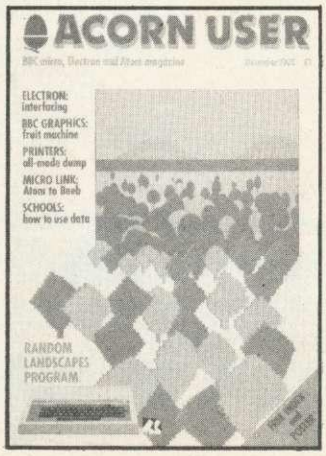
14. September Techniques – ink-blots and mazes. Painting by lightpen. DFS space explored. Beeb Forum. *Mega Monsters* game listing. Machine code graphics dumps. Atom Forum. Atom cassette recorder check. Reviews of Atom RAM boards, Cumana disc manual, *Logo* for schools, Hobbit floppy tape and books.

15. October Women and computing. Techniques – random numbers. Review of Computer Concepts' *Beebcalc*. Fractal graphics. 57 files on 40 & 80 track discs. *Vampire* game listing. Beeb Forum. Assembly code controls tab key. Osfile merging. Atom future. Atom verify routine. Reviews of *Vu-Type*, Procyon Atom book, Epson FX80, Teletext adapter, disc drive, software.

16. November Techniques – impossible problems. Contour graphics. Connecting two Beebs together. XREF: sorts & lists variable, function and procedure names. Assembler ultilities in Basic II. OS, VDU, *FX, OSBYTE calls – **pull-out poster**. Disc overlays. Adding extra Atom commands. Reviews of 7 educational packs, Atom ROM, books, games.



17. December Random graphics. Animated graphics in colour. Techniques – graphs. Hints & Tips. Universal printer dump. 6522 connected to the Electron. Saving machine code. Beeb Forum. Graphics **pull-out poster**. **Index:** July 82–July 83. Forum Extra: EQUS. BBC helps the disabled. Schools – data processing. Transferring data between Beebs, Atoms . . . or Pets. Atom block demolition utility. Atom disassembler program. Reviews of software, books, educational programs from Chalksoft.



18. January 1984: Games special issue Techniques – graphs part 2. Stacks and queues, Basic and languages. Hints & Tips. Voice chip revealed. How to write games. Electron interfacing. Beeb Forum. Life graphics routines. *Defencecom* game listing. *The Train Game* listing. Machine code graphics. Where to put machine code. Schools – handling data. Juki daisywheel printer examined. Atom Forum and adventure. Reviews of ultilities, software, *Beeline* wordprocessor, educational packages, two chess programs.



19. February: Adventures special issue Techniques – efficient sorts. PROC for a numeric keypad on the Beeb key-board. 12 graphics listings. Random access filing on disc. Locking files. MCP40 printer/plotter looked at. Hints & Tips. Beeb Forum. Make discs readable on 40 and 80 track drives. Screen memory organisation. Hints on adventure design. Adventure action. Adventure ideas in computer language. Text compression. Word-crunching. VIA chip on Electron to drive a parallel printer. Atom Forum. Schools – simulation packages. Reviews: *Disc Doctor*, Leasalink's DFS upgrade, Hitachi's microdrive system, Solidisk's sideway RAM board, software.

20. March Utility: timing routine. Fractals. Teletext and mode 7 dump. ROMs reviewed. Hints & Tips. Beeb Forum. Add sounds to your games. Learn Lisp 1. Cube graphics. Printer driver for View. Basic II from Basic I. Beeb's ADC chip. Atom Forum. Listing formatter for the Atom. Atom 'bytes free' routine. Schools – test of *Factfile*. Keyboard skills. Amcom DFS v Acorn DFS. Reviews: *Beebpen* wordprocessor, Atom expansion system, software, books.

21. April Beeb graphics on TV. 6845 chip explored. Advanced filing systems. Lisp 2. Hints & Tips. Beeb Forum. Choose disc tracks to copy. Function key editing. Teletext dumps. CES scrutinised. Passing variables. Computer Concepts' graphics ROM. Schools – simulations. Calculating Easter dates. Better programming. Atom Forum. Atom ROM routines. Converting BBC to Atom Basic. Three printers compared. Reviews: software, Aries B20 RAM board, *Toolkit*, Monitors.

22. May Bitstik graphics system. Hints & Tips. 6502 second processor examined. Lisp 3. Beeb Forum. Disc utility to keep track of available space. Statistics. Pattern graphics. OSWORD explained. 4 colour graphics listings. Second-hand disc drives. Education – do girls get a fair deal? Atom Forum. BBC to Atom Basic 2. Reviews: British Micro's Grafpad, *Edword* wordprocessor, 4 sprite generators, Opus micro-drive, Beasty, software.

23. June Acorn Z80 second processor. Forth. Graphics to brighten up your games. Soft Pottery graphics. Go faster and save memory space. Rapid search and load routine for tapes. How the Beeb and Electron work 1. Business: reviews and how to gently enter office computerisation. Education – adult literacy. Dumping Atom programs on the BBC. Atom Forum. Software copyright laws. Hints & Tips. Techniques – B-Trees. Beeb Forum. Reviews of monitors, printers, books, software, adventures, EPROM programmer.



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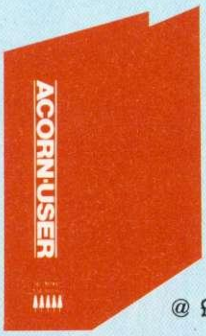
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SWORD MASTER is one of the few two-player games around, and is designed for joystick or keyboard.

Sword Master by Ken Worrall is based on the fencing rules written in 1190 by Herman von Salza for the Deutscritter Order of Teutonic Knights. It features full-colour machine code animation of a sword duel between two knights.

'A quality game with high class graphics . . . one of the most enjoyable games I have played' – **Home Computer Weekly**
'An immensely entertaining game with excellent graphics and animation' – **Personal Computer Games**
'Sword Master is a unique game' – **Personal Computer News**
'Slickly animated and suitably medieval' – **Popular Computing Weekly**



TREK was the first game to take advantage of **voice synthesis** on the BBC micro – and uses joystick or keyboard.

Trek puts you in charge of a Starship with the task of wiping out an alien fleet. It's an excellent adaptation of the classic game with 7 screen displays, 3 on-board computers and 2 weapon systems.

Versions have been written for BBC micro and Electron to use both machines to their full. The BBC tape uses voice synthesis (if the chips are fitted).

The game has been extensively developed from Tim Heaton's famous Trek III. It barely fits into 32K.

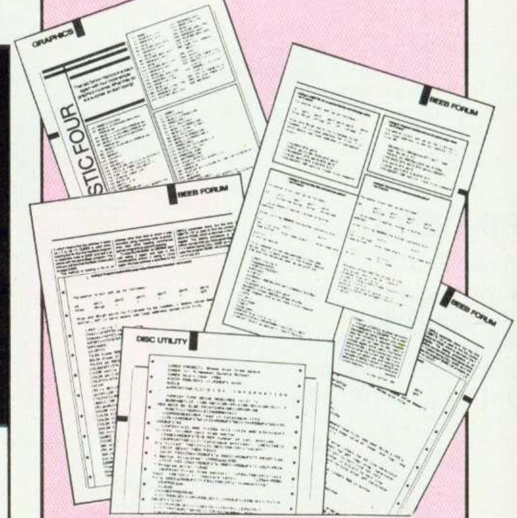
DISC UPGRADE SERVICE

Return your cassette of Trek or Swordmaster, and we will exchange it for a disc (which will run on 40 or 80-track drives) for just £3.50. Please specify Amcom, Watford or Acorn DFS.

PLUS

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Yes, at last, the tape you've been crying out for! Save the wear on your fingers by sending for one of our cassettes giving all the major listings in this issue.
Each cassette costs £3.75 (inclusive) for the Electron and BBC micro. This includes a menu and disc transfer routine to help you find your way around – and use on your own programs.
The tapes come with BBC programs on one side and Electron programs as the other, so it shouldn't be possible to mix the two.
Order form on page 95.



Save yourself the time and bother of typing in Acorn User listings

ORDER FORM ON PAGE 95

Acorn User is, we believe, the first UK magazine to print a listing in barcode (this one uses Telepen format). It has been made possible by a project developed by the MEP and Addison-Wesley Publishers, whose barcode reader will be released at the end of this month (see News). The first person to identify which listing in this issue is represented by this barcode dump will win an Addison-Wesley barcode reader package worth £50.

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END

SAVED...JUST IN TIME!

IT'S happened to all of us of course. Several long hours into the night and the latest programming masterpiece nears completion. Then – *slap, bang, wallop* – it happens. The computer throws a wobbly and all your hard work disappears from the memory banks, and we never made those regular programming saves to safeguard ourselves, did we?

Not to worry. James Clarke of Marlborough College has come up with the answer. An interrupt-driven program saver that automatically saves a copy of the current program in memory, between PAGE and TOP, to disc every four minutes or so.

The routine works by enabling the 'timer crossing zero event' and setting the interval timer to about four minutes or so away from 'crossing zero'. When the event occurs, control is passed to a save routine, no matter what the computer is doing at the time – even during a program run – and saves it. Once saved, control is passed back to the task in hand.

Using the program is simple. Type in the listing as shown and save the program under a suitable name. Now run the program to assemble the machine code and save the machine code as follows:

***SAVE ISAVE 8D0 900 8D0**

To use the program run the machine code with:

***ISAVE filename**

where filename is the name of the file you wish to assign to your file.

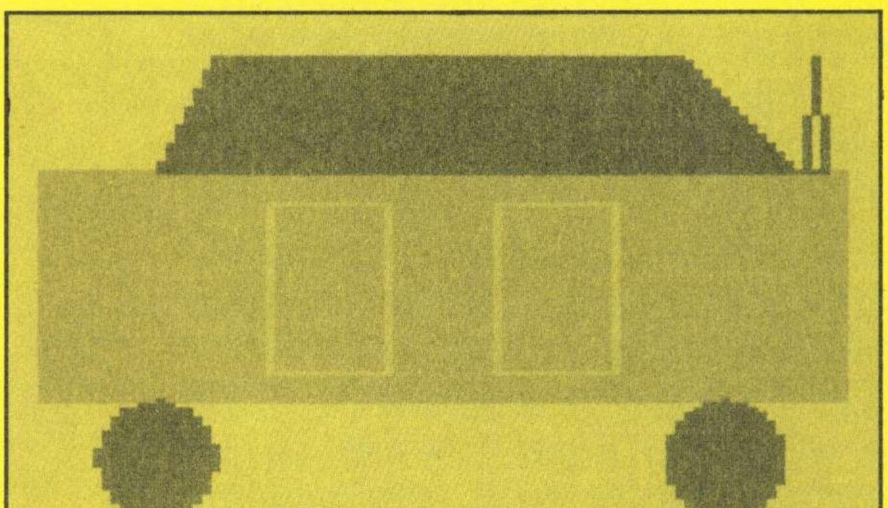
IF you have a useful program that you feel might make it to the top of our list then why not send in? Address it to Top of the Lists, *Acorn User*, Redwood Publishing, 68 Long Acre, London WC2E 9JH. Published contributions will earn their authors £25.

```
   10 REM Interrupt Program Saver
   20 REM J.E.CLARKE
   30 REM Acorn User Novemeber 1984
   40 REM BBC Micro with DFS
   50 :
   60 oswrch=&FFEE:osfile=&FFDD
   70 osfind=&FFCE:osnl=&FFE7
   80 osbyte=&FFF4:osword=&FFF1
   90 space%=&8D0:pblock=&9B5
  100 filename=&9D0:page=PAGE
  110 timebase=&70
  120 FOR T%=0 TO 2 STEP 2
  130 P%=space%
  140 [OPTT%
  150 .start
  160 LDA &706
  170 CMP# &20
  180 BNE syntax
  190 LDX# 0
  200 .loop
  210 LDA &707,X
  220 STA filename,X
  230 INX
  240 CMP# &0D
  250 BNE loop
  260 LDA#40
  270 LDX #filename MOD 256
  280 LDY #filename DIV 256
  290 JSR osfind
  300 LDA#0:LDY#0:JSR osfind
  310 LDA #&FF:STA timebase
  320 LDA #&AF:STA timebase+1
  330 LDA #&FF:STA timebase+2
  340 LDA #&FF:STA timebase+3
  350 LDA #&FF:STA timebase+4
  360 LDA #save MOD 256:STA &220
  370 LDA #save DIV 256:STA &221
  380 LDA #14:LDX #5:JSR osbyte
  390 .timeset
  400 LDA #4
  410 LDX #timebase MOD 256
  420 LDY #timebase DIV 256
  430 JSR osword
  440 RTS
  450 :
  460 .syntax
  470 JMP syntax1
  480 :
  490 .save
  500 PHP:PHA:TXA:PHA:TYA:PHA
  510 LDA #7:JSR oswrch
  520 LDA #13:LDX #5:JSR osbyte
  530 LDA #filename MOD256:STA pblock
  540 LDA #filename DIV256:STA pblock+1
  550 LDA #page   MOD256:STA pblock+2
  560 LDA #page   DIV256:STA pblock+3
  570 LDA #&8023  MOD256:STA pblock+6
  580 LDA #&8023  DIV256:STA pblock+7
  590 LDA #page   MOD256:STA pblock+10
  600 LDA #page   DIV256:STA pblock+11
  610 LDY &12:INY:TYA:STA pblock+14
  620 LDA &13:STA pblock+15
  630 LDA# 0:LDX# pblock MOD256:LDY# pbl
ock DIV256
  640 JSR osfile
  650 LDA #14:LDX #5:JSR osbyte
  660 JSR timeset
  670 PLA:TAY:PLA:TAX:PLA:PLP
  680 RTS
  690 :
  700 .syntax1
  710 JSR osnl
  720 LDX #0
  730 .loop2
  740 LDA syn,X
  750 JSR oswrch
  760 INX
  770 CMP #&0D
  780 BNE loop2
  790 JSR osnl
  800 RTS
  810 ]
  820 syn=P%+1
  830 $syn="Syntax: ISAVE <afsp>"+CHR$13
  840 NEXT
```

See 'Co-ordinated Moves', page 41

Listing 1. This program incorporates a variety of procedures to draw and fill in with colour the shapes that make up the 'car' pictured below

```
10 REM MOTOR CAR
20 REM Tessie Revivis
30 REM for BBC and Electron
40 REM (c) Acorn User October 84
50 :
60 MODE2
70 PROCfillrec (300,300,700,200,2)
80 PROCfilltri (400,500,450,500,450,600,1)
90 PROCfillrec (460,500,400,100,4)
100 PROCfilltri (860,500,960,500,860,600,1)
110 PROCcircle (400,250,50,1)
120 PROCfillcir (400,250,50,1)
130 PROCcircle (900,250,50,1)
140 PROCfillcir (900,250,50,1)
150 PROCrectangle (500,325,100,150,3)
160 PROCrectangle (700,325,100,150,3)
170 PROCtriangle (970,500,20,100,1)
180 END
190 :
200 DEF PROCrectangle (X%,Y%,SX%,SY%,C%)
210 GCOL0,C%
220 MOVE X%,Y%
230 DRAW X%+SX%,Y%
240 DRAW X%+SX%,Y%+SY%
250 DRAW X%,Y%+SY%
260 DRAW X%,Y%
270 ENDPROC
280 :
290 DEF PROCtriangle (X%,Y%,SX%,SY%,C%)
300 GCOL0,C%
310 MOVE X%,Y%
320 DRAW X%+SX%,Y%
330 DRAW X%+(SX%/2),Y%+SY%
340 DRAW X%,Y%
350 ENDPROC
360 :
370 DEF PROCcircle (X%,Y%,R%,C%)
380 GCOL 0,C%
390 VDU 29,X%;Y%;
400 c=COS(PI/30):s=SIN(PI/30)
410 OC=1 : OS=0
420 MOVE R%*OC,R%*OS
430 FOR A%=1 TO 60
440 NC=OC*c-OS*s
450 NS=OS*c+OC*s
460 DRAW R%*NC,R%*NS
470 OC=NC : OS=NS
480 NEXT
490 VDU29,0;0;
500 ENDPROC
510 :
520 DEF PROCfilltri (X%,Y%,X2%,Y2%,XA%,YA%,C%)
530 GCOL 0,C%
540 MOVE X%,Y%
550 MOVE X2%,Y2%
560 PLOT 85,XA%,YA%
570 ENDPROC
580 :
590 DEF PROCfillrec (X%,Y%,XS%,YS%,C%)
600 GCOL 0,C%
610 MOVE X%,Y%
620 MOVE X%+XS%,Y%
630 PLOT 85,X%+XS%,Y%+YS%
640 MOVE X%,Y%+YS%
650 PLOT 85,X%,Y%
660 ENDPROC
670 :
680 DEF PROCfillcir (X%,Y%,R%,C%)
690 GCOL 0,C%
700 VDU 29,X%;Y%;
710 FOR loop=-R% TO R%
720 PLOT77,0,loop
730 NEXT
740 VDU29,0;0;
750 ENDPROC
```



See page 45

Listing 1. Multiplications table testing program with time limit set using the INKEY statement, from Jonathan Tate

```
   10 REM Listing 1
   20 MODE 7
   30 VDU23,1,0;0;0;0;
   40 PRINTCHR$(141);CHR$(131);CHR$(157)
;CHR$(132)"          TABLES TEST"
   50 PRINTCHR$(141);CHR$(131);CHR$(157)
;CHR$(132)"          TABLES TEST"
   60 A=INKEY(300)
   70 VDU28,0,15,39,5
   80 VDU23,1,1,0;0;0;
   90 PRINTTAB(0,6)"This program will te
st your knowledge of the tables."
  100 INPUT"How many questions would you
 like in the test?.."N
  110 INPUT"How many seconds do you need
 to answer  each question?.."S
  120 VDU23,1,0;0;0;0;
  130 CLS:PRINTTAB(0,6)"Press RETURN as
soon as the question is displayed,"
  140 PRINT"followed by your answer,"
  150 PRINT"then press RETURN again."
  160 PRINT:PRINT"Press RETURN when read
y": A$=GET$
  170 right =0
  180 Z=0
  190 Z=Z+1:IF Z>N GOTO340
  200 P=RND(12)
  210 IF P=1 GOTO200
  220 Q=RND(12)
  230 IF Q=1 GOTO220
  240 CLS
  250 PRINTTAB(4,6)P;" TIMES ";Q
  260 finishtime=TIME+S*100:REPEAT UNTIL
 TIME>finishtime OR A$=GET$
  270 INPUTX
  280 IF TIME>finishtime PRINTCHR$(132)"
TOO SLOW!":A=INKEY(200):GOTO 190
  290 IF X=P*Q PRINT CHR$(131)"CORRECT":
right=right+1:A=INKEY(200):GOTO190
  300 IF X<>P*Q PRINTCHR$(129)"WRONG!"
  310 A=INKEY(200)
  320 PRINT"THE ANSWER IS ";P*Q
  330 A=INKEY(200):GOTO190
  340 CLS:PRINTTAB(5,6)"You got ";right;
" correct out of ";N
  350 A=INKEY(100)
  360 IF right/N=1 PRINTTAB(9,10)CHR$141
;CHR$129;CHR$157;CHR$133;CHR$136"BRILLIA
NT  "CHR$156
  370 IF right/N=1 PRINTTAB(9,10)CHR$141
;CHR$129;CHR$157;CHR$133;CHR$136"BRILLIA
NT  "CHR$156
  380 END
```

Listing 2. Modification of listing 1, incorporating three new procedures, making it easier to read

```
   10 REM Listing 2
   20 MODE 7
   30 VDU23,1,0;0;0;0;
   40 PRINTCHR$(141);CHR$(131);CHR$(157)
;CHR$(132)"          TABLES TEST"
   50 PRINTCHR$(141);CHR$(131);CHR$(157)
;CHR$(132)"          TABLES TEST"
   60 A=INKEY(300)
   70 VDU28,0,15,39,5
   80 VDU23,1,1,0;0;0;
   90 PRINTTAB(0,6)"This program will te
st your knowledge of the tables."
  100 INPUT"How many questions would you
 like in the test?.."N
  110 INPUT"How many seconds do you need
 to answer  each question?..."S
  120 VDU23,1,0;0;0;0;
  130 CLS:PRINTTAB(0,6)"As soon as the q
uestion is displayed,"
  140 PRINT"type in your answer,"
  150 PRINT"then press RETURN."
  160 PRINT:PRINT"Press RETURN when read
y": A$=GET$
  170 right =0
  180 Z=0
  190 Z=Z+1:IF Z>N GOTO 320
  200 P=RND(12)
  210 IF P=1 GOTO200
  220 Q=RND(12)
  230 IF Q=1 GOTO220
  240 CLS
  250 PRINTTAB(4,6)P;" TIMES ";Q
  260 finishtime=TIME+S*100
  270 INPUT X
  280 IF X=P*Q PROCright
  290 IF X<>P*Q PROCwrong
  300 IF TIME>finishtime PROCtimeout
  310 A=INKEY(200):GOTO190
  320 CLS:PRINTTAB(5,6)"You got ";right;
" correct out of ";N
  330 A=INKEY(100)
  340 IF right/N=1 PRINTTAB(9,10)CHR$141
;CHR$129;CHR$157;CHR$133;CHR$136"BRILLIA
NT  "CHR$156
  350 IF right/N=1 PRINTTAB(9,10)CHR$141
;CHR$129;CHR$157;CHR$133;CHR$136"BRILLIA
NT  "CHR$156
  360 END
  370 :
  380 DEFPROCright
  390 PRINT CHR$(131)"CORRECT"
  400 right=right+1
  410 ENDPROC
  420 :
  430 DEFPROCwrong
  440 PRINTCHR$(129)"WRONG!"
  450 PRINT"THE ANSWER IS ";P*Q
  460 ENDPROC
  470 :
  480 DEFPROCtimeout
  490 PRINTCHR$(132)"TOO SLOW!"
  500 ENDPROC
```

See page 45

Listing 3. Next round of changes . . .

```
   10 REM Listing 3
   20 MODE 7
   30 VDU23,1,0;0;0;0;
   40 PRINTCHR$(141);CHR$(131);CHR$(157)
;CHR$(132)"          TABLES TEST"
   50 PRINTCHR$(141);CHR$(131);CHR$(157)
;CHR$(132)"          TABLES TEST"
   60 A=INKEY(300)
   70 VDU28,0,15,39,5
   80 VDU23,1,1,0;0;0;
   90 PRINTTAB(0,6)"This program will te
st your knowledge of the tables."
  100 INPUT"How many questions would you
 like in the test?.."N
  110 INPUT"How many seconds do you need
 to answer  each question?..."S
  120 VDU23,1,0;0;0;0;
  130 CLS:PRINTTAB(0,6)"As soon as the q
uestion is displayed,"
  140 PRINT"type in your answer,"
  150 PRINT"then press RETURN."
  160 PRINT:PRINT"Press RETURN when read
y": A$=GET$
  170 right=0:Z=0:timeout=0
  180 REPEAT:Z=Z+1
  190 P=1+RND(9)
  200 Q=1+RND(9)
  210 CLS
  220 PRINTTAB(4,6)P;" TIMES ";Q
  230 finishtime=TIME+S*100
  240 INPUT X
  250 IF X=P*Q PROCright
  260 IF X<>P*Q PROCwrong
  270 IF TIME>finishtime+100 PROCtimeout
  280 A=INKEY(200)
  290 UNTIL Z=N
  300 PROCresults
  310 END
  320 :
  330 DEFPROCright
  340 PRINT CHR$(131)"CORRECT"
  350 right=right+1
  360 ENDPROC
  370 :
  380 DEFPROCwrong
  390 PRINTCHR$(129)"WRONG!"
  400 PRINT"THE ANSWER IS ";P*Q
  410 ENDPROC
  420 :
  430 DEFPROCtimeout
  440 PRINTCHR$(132)"TOO SLOW!"
  450 timeout=timeout+TIME-finishtime
  460 ENDPROC
  470 :
  480 DEFPROCresults
  490 CLS
  500 PRINTTAB(0,6)"You got ";right;" co
rrect out of ";N
  510 IF timeout>100 THEN PRINT"but took
 ";timeout DIV 100;" seconds too long":E
NDPROC
  520 IF right<N THEN ENDPROC
  530 PRINTTAB(9,9)CHR$141;CHR$129;CHR$1
57;CHR$133;CHR$136"BRILLIANT     "CHR$156
  540 PRINTTAB(9,10)CHR$141;CHR$129;CHR$
157;CHR$133;CHR$136"BRILLIANT     "CHR$15
6
  550 A=GET
  560 ENDPROC
```


Listing 4. The final stage, with question and answer printed on-screen in double-height

```
   10 REM Listing 4
   20 MODE 7
   30 VDU23,1,0;0;0;0;
   40 PRINTCHR$(141);CHR$(131);CHR$(157)
;CHR$(132)"          TABLES TEST"
   50 PRINTCHR$(141);CHR$(131);CHR$(157)
;CHR$(132)"          TABLES TEST"
   60 A=INKEY(300)
   70 VDU28,0,15,39,5
   80 VDU23,1,1,0;0;0;
   90 PRINTTAB(0,6)"This program will te
st your knowledge of the tables."
  100 INPUT"How many questions would you
 like in the test?.."N
  110 INPUT"How many seconds do you need
 to answer  each question?..."S
  120 VDU23,1,0;0;0;0;
  130 CLS:PRINTTAB(0,6)"As soon as the q
uestion is displayed,"
  140 PRINT"type in your answer,"
  150 PRINT"then press RETURN."
  160 PRINT'"Press RETURN when ready":A$
=GET$
  170 right=0:Z=0:timeout=0
  180 REPEAT:Z=Z+1
  190 P=1+RND(9)
  200 Q=1+RND(9)
  210 CLS
  220 answer$=""
  230 finishtime=TIME+S*100
  240 REPEAT
  250 PRINTTAB(4,6)CHR$141 P;" TIMES ";Q
;" = "answer$
  260 PRINTTAB(4,7)CHR$141 P;" TIMES ";Q
;" = "answer$
  270 A$=GET$:answer$=answer$+A$
  280 UNTIL A$=CHR$(13)
  290 X=VAL(answer$)
  300 IF X=P*Q PROCright
  310 IF X<>P*Q PROCwrong
  320 IF TIME>finishtime+100 PROCtimeout
  330 A=INKEY(200)
  340 UNTIL Z=N
  350 PROCresults
  360 END
  370 :
  380 DEFPROCright
  390 PRINT CHR$(131)"CORRECT"
  400 right=right+1
  410 ENDPROC
  420 :
  430 DEFPROCwrong
  440 PRINTCHR$(129)"WRONG!"
  450 PRINT"THE ANSWER IS ";P*Q
  460 ENDPROC
  470 :
  480 DEFPROCtimeout
  490 PRINTCHR$(132)"TOO SLOW!"
  500 timeout=timeout+TIME-finishtime
  510 ENDPROC
  520 :
  530 DEFPROCresults
  540 CLS
  550 PRINTTAB(0,6)"You got ";right;" co
rrect out of ";N
  560 IF timeout>100 THEN PRINT"but took
 ";timeout DIV 100;" seconds too long":E
NDPROC
  570 IF right<N THEN ENDPROC
  580 PRINTTAB(9,9)CHR$141;CHR$129;CHR$1
57;CHR$133;CHR$136"BRILLIANT     "CHR$156
  590 PRINTTAB(9,10)CHR$141;CHR$129;CHR$
157;CHR$133;CHR$136"BRILLIANT    "CHR$156
  600 A=GET
  610 ENDPROC
```

See 'Mirror and Clone', page 65



HOW TO ENTER DESIGN AND ASSEMBLER

SOME of you will already have the original version from September's issue of Acorn User, without the new procedures. Others will be entering the entire thing from scratch. We'll deal with this latter group first. The programs must be entered and RUN with PAGE set to &1900. Just type

PAGE = &1900 <RETURN> NEW <RETURN>

It's best to enter the assembler program first. Type

AUTO 940 <RETURN>

and enter the listing. AUTO provides you with a new line number each time you press return. The odd-numbered lines containing REMs, 965, 1315, 1605, and 2705 should be left out – they're for information only. You can put them in later if you want. When you've entered all of the assembler press Escape and re-enter line 950 as:—

950 FOR J% = 0 TO 3 STEP 3

It's a good idea at this point to save the program in the normal way. Now type PROCassemble <RETURN>. If you have made any syntax errors in the listing they will be reported. Sort them out and when no errors are being reported, change line 950 back to:

950 FOR J% = 0 TO 2 STEP 2

To check that no other errors have been made you can make a number of tests. First of all, type PROCassemble, then type PRINT P%. This should produce the response 4830. If you don't get this answer you have a typing error. To find out where it is, type PRINT pixad. This should give the answer 4471. If it doesn't, you have made a mistake in the first quarter of the program, up to line 1690. When that's sorted, type PROCassemble again, followed by PRINT loop2. The answer here should be 4611. If not, your mistake is between lines 1690 and 2510. To check the third quarter type PROCassemble again and then PRINT zero. The correct answer is 4719, otherwise you have a mistake between lines 2510 and 3620. The last quarter is tested now by typing PROCassemble and then PRINT P%. The answer should be 4830.

The final test is to add the following lines to the program

```
1 PROCassemble
2 Z% = 0
3 FORN% = &1100 TO &12DD
4 Z% = Z% + ?N%
5 NEXT
6 PRINT"CHECKSUM IS :";Z%
7 END
```

RUN the program and you should get the answer 55856. If not you will have to recheck the whole listing. Look out for things like TYA being TAY or missing symbols like #.

Now that you've got it all OK you can delete lines 1 to 7, save the listing, type PROCassemble, and then save the machine code that it has generated by typing

*SAVE EDCODE 1100 12DE

Now, if you're still in good form, type NEW followed by AUTO and enter the 'Design' program starting at line 10. Ignore any lines before line 10. They will make the program too long. Type everthing in exactly as it is printed and be careful not to put in any extra spaces. There are 4 lines with odd numbers – 245, 315, 345 and 795.

It's easier to leave them out the first time through and enter them afterwards. You must remember to put them in though. When you've finished, press Escape to stop the AUTO line numbers being generated, and then type PRINT TOP. This should give the answer 11908, or something very close. If it doesn't, have you remembered to put in the four odd-numbered lines? Save the program.

Line 30 loads the machine code generated by PROCassemble so if you are using tape you should ensure that a copy of EDCODE comes immediately after the 'Design' program on your tape. You can do this by reloading PROCassemble, winding your tape on to the end of 'Design', typing PROCassemble, and typing:

*SAVE EDCODE 1100 12DE

Now you're ready to go. Just CHAIN "DESIGN" in the normal way. It will load the machine code automatically and you can get on with designing thingies from other galaxies or special symbols or whatever.

MODIFYING THE ORIGINAL DESIGN

THOSE of you who already have the original program can add the new facilities without too much trouble.

First load the program (with PAGE set to &1900 of course) and type DELETE0,935. Then type AUTO 2900 and enter the new lines of assembler, starting at 2900 in the listing. All lines before that are unchanged. Follow the instructions given above for debugging the assembler and *SAVE the code as EDCODE. Save PROCassemble as well so that you have a copy of the source code.

Load 'Design' again and type DELETE0,190. Type DELETE940,2920. Now type AUTO and enter lines 10 to 190. When you've finished, press Escape to get out of AUTO then type AUTO940 and enter the lines from that point in this month's 'Design' listing. Press Escape when you've finished. If you included the 'separator' lines 575, 625, 725, 775 and 935 in the original program, delete them now. They use five bytes each and memory's very tight. Now, delete lines 330, 560 and 730 to 770 inclusive.

New lines to be added from this month's listing are 245, 315, 345 and 795. Lines to be changed are 240, 490, 500, 510, 550, 570, 670, 710, 790, 800, 850, 860, 870, 880, 890 and 920. That looks a lot, but the changes are quite small. When you've done all this, type PRINT TOP. The answer should be about 11896. If it's much more than this you may get the awful 'no room' message when you run the program. Check that you've removed all the lines listed above, and that you haven't added any spaces. Typing WIDTH40 and listing the program should give you exactly what you see in the yellow pages.

NEW PROCEDURES

(For other procedures see the September issue of Acorn User.)

140 to 490 PROCed
This is the procedure that handles screen output when you are editing or designing new sprites. It tests for keypresses and takes appropriate action. It was originally the main control loop of the program. See September issue for a fuller description.

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510 to 570 PROCen
Tells you how many sprites you have designed, where the data is in memory, and asks you whether you want to save the data. PROCsave does this automatically if you do.

940 to 1080 PROCshow
Sets up the mode 2 screen if you are editing, ensuring that the 'design box' is the right size and central, and displaying the sprite you want to edit.

1090 to 1260 PROCmenu
Prints up the options and takes appropriate action depending on your choice (returned in G%). If you want to carry out some operation on an existing design, PROCfi is called (see below). If you choose cloning or mirroring, the relevant procedure is called.

1270 to 1310 PROCfi
Asks if the sprite data is already in memory, and if not it sets A% = &FF, which causes the now misleadingly titled PROCsave to load the data. All PROCsave does is to set up a parameter block at &3000 and call OSFILE at &FFDD. If A% = 0 this routine will save a file; if A% = &FF, it will load it.

1320 to 1590 PROCmi
A series of loops to reverse sprites 0 to 3 and put these mirror images into the data areas of sprites 4 to 7. It sends the data from each of the 24 rows of a sprite to zero page locations starting at &80, and then calls the machine code routine 'reverse' at &1258 (line 1470). This swaps the pixels in each byte and the loop at 1480 to 1510 puts the changed bytes into their new locations.

1600 to 1730 PROCcl
Finds out which sprite you want to clone and works out where to put the cloned image. Lines 1630 to 1700 check to see if the right-hand column of the design is clear so the design can be shifted to the right without anything falling off the end. If all is well the clone routine at &1274 is called.

1740 to 1850 PROCin
If you choose to design new sprites this procedure is called to clear work areas and initialise the control variables. It finds out what width you want for your sprites, sets up the address table starting at &12F0 accordingly, and sets ?&12EF = 8 * sprite width – ie the block size.

1860 to 1970 PROCno
When you elect to quit, this procedure looks through memory to see how many sprites you have designed and where they are. It is called by PROCen, which needs this information before it can call PROCsave.

HINT FOR OWNERS OF TAPE OR ECONET MACHINES

IT'S easy to forget that these programs have to be run with PAGE set at &1900. A simple way to overcome this is to have a short loader program which will handle it for you:

```
10*KEY10PA. = &1900!MNEW!MCH."DES!GN"!M
20*FX138,0,138
```

For Econet machines lines 10 should read:

```
10*KEY10?&224 = &A6!MPA. = &1900!MNEW!MCH.
  "DESIGN"!M
```

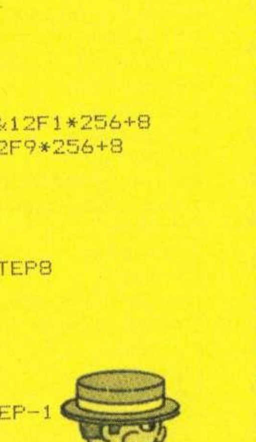
Be careful not to put any spaces after the final M in line 10.

If you save this little program as "DES", immediately before "DESIGN" on your tape, you can forget all about setting PAGE. Just CHAIN"DES" and it will load the other program at the right location.

The completed version of the 'Design' program, incorporating new procedures (see above for instructions)

```
   10*KEY10?&224=&A6|MPA.=&1900|MOLD|M
   20*TV255
   30*LO.EDCODE
   40REPEAT
   50CLS
   60PROCmenu
   70IFG%=4 MODE7:PROCin
   80IFG%=1 ORG%=4 MODE2:PROCed
   90MODE 7
  100UNTILG%=5
  110MODE7:A%=0:PROCen
  120*FX4
  130PRINT:END
  140DEFPROCed
  150W%=?&12EF/8
  160table%=&12F0:end%=FALSE
  170*FX4,1
  180VDU23,1,0;0;0;0;
  190VDU23,240,0,0,&F0,&F0,&F0,&F0,0,0,2
3,241,0,0,&40,&E0,&40,0,0,0
  200key$="0123456789ABCDEF"
  210REPEAT
  220I%=cha%*2:base%=I%?&12F0+I%?&12F1*2
56+8
  230space%=(80-?&12EF DIV8*7)DIV8
  240CLG:IF cha%<>0:?&71=space%:FORI%=0T
O cha%-1:?&70=I%:?&72=16:CALL&1193:?&71=
?&71+?&12EF/8+space%:NEXT
  245VDU26,5:S%=(?&12EF DIV8-4)*16+408:M
OVES%,820:GCOL0,3:PRINT"char";cha%
  250VDU28,0,22,7,9,4
  260VDU30:COLOUR7:PRINT"KEYS"
  270@%=0:PRINTTAB(0,2)"0";TAB(2);"8";:C
OLOUR8:PRINTCHR$240:FORI%=1TO7:COLOURI%:
PRINTI%;CHR$240;~I%+8;:COLOURI%+8:PRINTC
HR$240:COLOURI%-1:NEXT
  280VDU28,0,31,19,21
  290COLOUR6:PRINTTAB(2,0)"Press TAB whe
n"'';TAB(2)"design finished":COLOUR3
  300PRINT'TAB(1)"use cursor keys to"''"
  position pointer"
  310W%=?&12EF/4:VDU29,440-8*(W%-8)-8;40
0;:MOVE0,0
  315GCOL0,7
  320PLOT21,0,12*32+6:PLOT29,W%*32+8,12*
32+6:PLOT21,W%*32+8,0:PLOT29,0,0
  340X%=8:Y%=24
  345IFG%=1 PROCshow
  350PROCpntr(X%,Y%)
  360REPEAT
  370K%=INSTR(key$,GET$)
  380IF K%<>0 col%=K%-1:PROCdraw(col%,X%
,Y%):PROCpntr(X%,Y%)
  390IFINKEY(-58)ANDY%<384 PROCpntr(X%,Y
%):Y%=Y%+16:PROCpntr(X%,Y%)
  400IFINKEY(-42)ANDY%>24 PROCpntr(X%,Y%
):Y%=Y%-16:PROCpntr(X%,Y%)
  410IFINKEY(-26)ANDX%>8 PROCpntr(X%,Y%)
:X%=X%-32:PROCpntr(X%,Y%)
  420IFINKEY(-122)ANDX%<32*(W%-1) PROCpn
tr(X%,Y%):X%=X%+32:PROCpntr(X%,Y%)
  430UNTILINKEY(-97)
  440cha%=cha%+1:IFcha%=2 cha%=3 ELSE IF
cha%=6 cha%=7
  450VDU4,12,23,1,0;0;0;0;
  460IF cha%=8 PRINTTAB(2,0)"8 chars. de
fined.";TAB(4,2)"No more room.";TAB(2,7)
;:COLOUR3:PRINT"SPACE to continue":end%=
```

```
TRUE:ELSE PRINTTAB(7,2)"press";TAB(1,4);
:COLOUR3:PRINT" SPACE to continue";TAB(2
,6);:COLOUR6:PRINT"  CTRL Z to exit "
  470REPEATG=GET:UNTILG=&20 ORG=&1A:IFG=
&1A end%=TRUE
  480UNTIL end%
  490ENDPROC
  500DEFPROCen
  510PROCno
  520PRINTTAB(0,2)" Data goes from"CHR$1
34"&1300"CHR$135"to"CHR$134;"&";~base%+3
*?&12EF:PRINT'';CHR$131;cha%;CHR$135;"ch
aracters defined"CHR$131;"(0 to ";cha%-1
;")."
  530PRINT''" Table of addresses is @";C
HR$130;"&12F0";CHR$135;"to";CHR$130;"&";
~&12F0+cha%*2-1
  540PRINT''" Do you want to save the da
ta and the "'" address table (Y/N)?";:RE
PEATG=GET OR&20:UNTILG=&79 ORG=&6E
  550IFG=&79 A%=0:PROCsave
  570ENDPROC
  580DEFPROCpntr(X%,Y%)
  590VDU5
  600MOVEX%,Y%
  610GCOL3,7
  620PRINTCHR$241
  630ENDPROC
  640DEFPROCdraw(col%,X%,Y%)
  650VDU5
  660MOVEX%,Y%
  670?&88=(X%-6)DIV32:?&89=23-((Y%-24)DI
V16):?&87=col%:?&1137=base%MOD256:?&1138
=base%DIV256:?&1168=base%MOD256:?&1169=b
ase%DIV256
  680!&70=&4F78+(?&12EF*2)
  690GCOL0,col%
  700PRINTCHR$240
  710CALL&1100
  720ENDPROC
  780DEFPROCsave
  790IFA%=0 PRINT''" What do you want to
 call the file?"'CHR$136;"(max. 7 letter
s - no quotes needed)"
  795IFA%=&FF PRINT''TAB(2)"What is the
name of the sprite file?"
  800REPEAT:PRINTTAB(14)SPC(20):INPUTTAB
(14)" "data$:UNTILLENdata$<=7
  810FORI%=&3000 TO&3030:?I%=0:NEXT
  820D%=&3000
  830$(D%+&20)=data$:?D%=&20:D%?1=&30
  840D%?2=&EE:D%?3=&12
  850IF A%=&FF D%?6=1
  860D%?&A=&EE:D%?&B=&12
  870IF A%=0 D%?&E=(base%+(3*?&12EF)+1)M
OD256:D%?&F=(base%+(3*?&12EF)+1)DIV256
  880X%=0:Y%=&30
  890PRINTTAB(4)"Press RETURN when you'r
e ready."'
  900REPEATUNTILGET=13
  910CALL&FFDD
  920IFA%=0 PRINT'" Data saved as "data$
 ELSE CLS
  930ENDPROC
  940DEFPROCshow
  950Z%=0
  960REPEAT
  970VDU5,29,444-8*(W%-8)-8+Z%;400;:MOVE
0,0
  980FORI%=0TO(3*?&12EF)-1:X3%=(I%MOD?&1
2EF)DIV8:Y3%=-((I%MOD8)+8*(I%DIV?&12EF))
+23
  990X3%=(X3%*2)*32+6:Y3%=Y3%*16+24
 1000?&80=I%?base%:?&81=0:IFZ%=0 CALL&12
3C ELSECALL&124A
 1010GCOL0,?&81
 1020MOVEX3%,Y3%:PRINTCHR$240
 1030NEXT
 1040Z%=Z%+32
 1050UNTILZ%=64
 1060VDU29,440-8*(W%-8)-8;400;:MOVE0,0'
 1070?&70=cha%:?&71=47+(?&12EF/4):?&72=9
6:CALL&1193
 1080ENDPROC
 1090DEFPROCmenu
 1100VDU26:@%=0
 1110PRINTTAB(16,3)"MENU"
 1120FORJ%=6 TO 14 STEP2:PRINTTAB(0,J%)"
  ":NEXT
 1130PRINTTAB(4,6)"1. Edit already defin
ed sprites."
 1140PRINTTAB(4,8)"2. Clone existing des
ign."
 1150PRINTTAB(4,10)"3. Produce mirror im
ages of sprites."
 1160PRINTTAB(4,12)"4. Design new sprite
s."
 1170PRINTTAB(4,14)"5. Quit."
 1180PRINTTAB(4,16)"Please select a numb
er...";
 1190REPEAT PRINTTAB(31,16)CHR$127+CHR$1
27;:INPUTTAB(28,16)" "G%:UNTIL G%>0 AND
G%<6
 1200VDU28,0,24,39,16,12
 1210IFG%<4 PROCfi ELSE IF G%<>5 FORV%=0
TO&5FF STEP4:V%!&12EE=0:NEXT
 1220IFG%=1 REPEAT:PRINTTAB(0,3)"Which c
har - 0 to 7 ";:INPUTcha%:UNTILcha%>=0 A
NDcha%<8
 1230IF G%=2 PROCcl
 1240IF G%=3 CLS:PRINTTAB(4)"Please wait
 a moment.":PROCmi
 1250CLS
 1260ENDPROC
 1270DEFPROCfi
 1280PRINTTAB(4)"Is the data already in
memory?";
 1290REPEAT:G=GET OR&20:UNTILG=&79 ORG=&
6E
 1300IFG=&6E A%=&FF:PROCsave:ELSEIF(?&12
EF<32 OR?&12EF>80)G%=7
 1310ENDPROC
 1320DEFPROCmi
 1330?&8D=?&12EF DIV8-1
 1340CH%=0
 1350REPEAT
 1360ADD%=CH%?&12F0+CH%?&12F1*256+8
 1370V%=CH%?&12F8+CH%?&12F9*256+8
 1380C%=0
 1390REPEAT
 1400FORI%=0TO7
 1410L%=&80
 1420FORJ%=0TO?&12EF-8 STEP8
 1430K%=I%+J%
 1440?L%=K%?ADD%
 1450L%=L%+1
 1460NEXT
 1470CALL&1258
 1480FORM%=L%-1 TO&80 STEP-1
 1490N%=K%-(M%-&80)*8
 1500N%?V%=?M%
 1510NEXT
 1520NEXT
```



Continued ▶

```
 1530ADD%=ADD%+?&12EF:V%=V%+?&12EF:C%=C%
+1
 1540UNTILC%=3
 1550CH%=CH%+2
 1560IFCH%=4 CH%=6
 1570UNTILCH%=8
 1580PRINT''"OK. chars 4 to 7 are now mir
ror images  of chars 0 to 3"''TAB(7)"Pre
ss SPACE to continue..":REPEATUNTILGET=3
2
 1590ENDPROC
 1600DEFPROCcl
 1610REPEAT PRINT'TAB(3,1)"Which charact
er do you want to clone     (0 to 6)    "
+CHR$127+CHR$127+CHR$127;:INPUTK$:UNTILA
SC(K$)>=48 AND ASC(K$)<55:CR%=EVAL(K$)
 1620CR%=CR%*2:?&94=(CR%?&12F0)+8:?&95=C
R%?&12F1:?&96=(CR%?&12F2)+8:?&97=CR%?&12
F3:F%=0:E%=0:CA%=CR%?&12F0+CR%?&12F1*256
+8
 1630REPEAT
 1640B%=?&12EF-8
 1650REPEAT
 1660IF (B%?CA% AND &55)<>0 F%=1
 1670B%=B%+1
 1680UNTIL B%=?&12EF OR F%=1
 1690CA%=CA%+?&12EF:E%=E%+1
 1700UNTILF%=1 ORE%=3
 1710IFF%=1 PRINTTAB(3,4)"No space on ri
ght of sprite."ELSE CALL&1274:PRINTTAB(1
9)"OK"
 1720PRINTTAB(8,7)"Press SPACE to contin
ue":REPEATUNTIL GET=32
 1730ENDPROC
 1740DEFPROCin
 1750FORJ%=0TO1:PRINTTAB(7,3+J%)CHR$129+
CHR$157+CHR$141+CHR$135"SPRITE DESIGN"+C
HR$9+CHR$9+CHR$9+CHR$156:NEXT
 1760PRINTTAB(0,7)" You may design sprit
es between 8 and 20 pixels wide - only e
ven  nos. allowed"''" Please enter width
 :"
 1770REPEATPRINTTAB(21,10)SPC(25);:INPUT
TAB(21,10)" "W%:UNTILW%>7ANDW%<21 AND NO
TW%MOD2
 1780W%=W%/2:IFW%=4 RESTORE1810 ELSEIFW%
=5 RESTORE1820 ELSE RESTORE1830
 1790FORI%=&12F0 TO&12FF STEP 2:READA$:!
I%=EVAL("&"+A$):NEXT
 1800?&12EF=W%*8
 1810DATA1300,1360,1300,1400,1460,1500,1
460,1560
 1820DATA1300,1378,1300,1400,1478,1500,1
478,1578
 1830DATA1300,1400,1300,1500,1600,1700,1
600,1800
 1840cha%=0
 1850ENDPROC
 1860DEFPROCno
 1870F%=0
 1880REPEAT:E%=0
 1890BA%=F%?&12F0+F%?&12F1*256+8
 1900J%=0:REPEAT:IFJ%!BA%<>0 E%=1
 1910J%=J%+4:UNTILJ%>=3*?&12EF ORE%=1
 1920IFE%=1 F%=F%+2:IFF%=4 ORF%=12 F%=F%
+2
 1930UNTILF%=16 ORE%=0
 1940IFF%=6 ORF%=14 F%=F%-4:H%=1 ELSEH%=
0
 1950cha%=F%/2:IF(cha%=1 ORcha%=5)ANDH%=
1 cha%=cha%+2
 1955IFH%=0 F%=F%-2
 1960base%=F%?&12F0+F%?&12F1*256+8
 1970ENDPROC
```

The assembler section of 'Design'

```
  940DEFPROCassemble
  950FORJ%=0TO2 STEP2
  960P%=&1100
  965REM Square bracket
printed as left
arrow in Mode7
  970[OPTI%
  980.byte_number
  990LDA&89
 1000AND#7
 1010STA&8F
 1020LDA&89
 1030AND#&F8
 1040LSRA:LSRA:LSRA
 1050TAY
 1060LDX#0
 1070DEY
 1080BMI no_add
 1090LDA&12EF
 1100INX
 1110DEY
 1120BMI no_add
 1130INX
 1140CLC
 1150ADC&12EF
 1160.no_add
 1170CLC
 1180ADC&8F
 1190STA&8F
 1200LDA&88
 1210AND#&FE
 1220ASLA
 1230ASLA
 1240CLC
 1250ADC&8F
 1260STA&8F
 1270STA&8D
 1280JSR pixad
 1290.byte_value
 1300LDX&8F
 1310.address
 1315\dummy address
 1320LDA &8000,X
 1330STA&86
 1340LDA#0
 1350STA&85
 1360LDY#4
 1370CLC
 1380LDA&88
 1390LSRA
 1400BCC even
 1410CLC
 1420.odd
 1430ROR&86
 1440ROR&87
 1450ROR&85
 1460ROR&86
 1470ROR&85
 1480DEY
 1490BNE odd
 1500JMP store
 1510.even
 1520ROR&86
 1530ROR&85
 1540ROR&86
 1550ROR&87
 1560ROR&85
 1570DEY
 1580BNE even
 1590.store
 1600LDA&85
 1605\dummy address
 1610STA &8000,X
 1620LDA#0
 1630STA&86
 1640STA&87
 1650LDY&8D
 1660LDA&85
 1670STA(&70),Y
 1680RTS
 1690.pixad
 1700DEX
 1710BMI end
 1720LDA&70
 1730CLC
 1740ADC#&80
 1750STA&70
 1760LDA&71
 1770ADC#2
 1780STA&71
 1790LDA&8D
 1800SEC
 1810SBC&12EF
 1820STA&8D
 1830JMP pixad
 1840.end
 1850RTS
 1860.display
 1870LDA#0
 1880STA&81
 1890LDA#&30
```

```
1900STA&83
1910LDA&71
1920ASLA
1930ROL&81
1940ASLA
1950ROL&81
1960ASLA
1970ROL&81
1980STA&82
1990LDA&81
2000CLC
2010ADC&83
2020STA&83
2030LDA&72
2040AND#7
2050EOR&72
2060LSRA
2070STA&81
2080LSRA
2090LSRA
2100ADC&81
2110LSRA
2120STA&81
2130LDA#0
2140RORA
2150CLC
2160ADC&82
2170STA&80
2180LDA&81
2190ADC&83
2200STA&81
2210LDA#&80
2220CLC
2230ADC&80
2240STA&82
2250LDA#2
2260ADC&81
2270STA&83
2280LDA#&80
2290CLC
2300ADC&82
2310STA&84
2320LDA#2
2330ADC&83
2340STA&85
2350LDA#&80
2360CLC
2370ADC&84
2380STA&86
2390LDA#2
2400ADC&85
2410STA&87
2420LDA&70
2430ASLA
2440TAY
2450LDA&12F0,Y
2460CLC
2470ADC#8
2480LDX#0
2490STA&88,X
2500CLC
2510.loop2
2520ADC&12EF
2530INX
2540INX
2550CPX#8
2560BCS over
2570STA&88,X
2580BCC loop2
2590.over
2600CLC
2610INY
2620LDA&12F0,Y
2630LDX#0
2640.loop3
2650STA&89,X
2660INX
2670INX
2680CPX#8
2690BCC loop3
2700LDY&12EF
2705\ draws character
2710.mainloop
2720TYA
2730BEQ out
2740DEY
2750LDA(&88),Y
2760BEQ block2
2770STA(&80),Y
2780.block2
2790LDA(&8A),Y
2800BEQ block3
2810STA(&82),Y
2820.block3
2830LDA(&8C),Y
2840BEQ loopend
2850STA(&84),Y
2860.loopend
2870JMP mainloop
2880.out
2890RTS
2900.Lhand
2910LDA&80
2920AND#&AA
2930LDX#3
2940.loop4
2950ROLA
2960ROL&81
2970ROLA
2980DEX
2990BPL loop4
3000RTS
3010.Rhand
3020LDA&80
3030AND#&55
3040LDX#3
3050.loop5
3060ROLA
3070ROLA
3080ROL&81
3090DEX
3100BPL loop5
3110RTS
3120.mirror
3130LDX&8D
3140.loop6
3150LDA&80,X
3160BEQ zero
3170AND#&AA
3180CLC
3190RORA
3200STA temp
3210LDA&80,X
3220AND#&55
3230ROLA
3240ADC temp
3250STA&80,X
3260.zero
3270DEX
3280BPL loop6
3290RTS
3300.temp
3310NOP
3320.clone
3330LDA&94
3340STA&90
3350LDA&95
3360STA&91
3370LDA&96
3380STA&92
3390LDA&97
3400STA&93
3410JSR shiftR
3420LDX#2
3430.loop7
3440LDA&94
3450CLC
3460ADC&12EF
3470STA&94
3480STA&90
3490LDA&96
3500CLC
3510ADC&12EF
3520STA&96
3530STA&92
3540JSR shiftR
3550DEX
3560BNE loop7
3570RTS
3580.shiftR
3590LDA#8
3600STA&7F
3610.newblock
3620LDA&12EF
3630SEC
3640SBC#8
3650TAY
3660.samerow
3670LDA(&90),Y
3680AND#&AA
3690LSRA
3700STA(&92),Y
3710TYA
3720SEC
3730SBC#8
3740TAY
3750BMI nextrow
3760LDA(&90),Y
3770AND#&55
3780ASLA
3790PHA
3800TYA
3810CLC
3820ADC#8
3830TAY
3840PLA
3850CLC
3860ADC(&92),Y
3870STA(&92),Y
3880TYA
3890SEC
3900SBC#8
3910TAY
3920BPL samerow
3930.nextrow
3940INC&90
3950INC&92
3960DEC&7F
3970BNE newblock
3980RTS
3990]
4000NEXT
4010ENDPROC
```



See 'Follow the Floating Point', page 74

Program 1. Copies the contents of FAC1 into memory, allowing them to be examined

```
   10 REM Memory to FAC1 Demo
   20 REM Bruce Smith
   30 REM For the BBC Micro
   40 REM (c) Acorn User November 1984
   50 :
   60 FOR pass=0 TO 2 STEP 2
   70 fac1=&2E
   80 base=&70
   90 P%=&C00
  100 [OPT pass
  110 .memfac1
  120 LDA &70     \ get lo.byte fp addr
  130 STA &4B     \ save in fp vector
  140 LDA &71     \ get hi.byte fp addr
  150 STA &4C     \ save in fp vector
  160 JSR &A3B5   \ expand fp into FAC1
  170 LDX £7        \ set up loop count
  180 .loop
  190 LDA fac1,X  \ get byte from FAC1
  200 STA base,X  \ save in zero page
  210 DEX         \ decrement loop count
  220 BPL loop    \ repeat until minus
  230 RTS
  240 ]
  250 NEXT
  260 :
  270 !&70=&4000
  280 REM *** FP &345 ***
  290 ?&4000=&8A:?&4001=&D1
  300 ?&4002=&40: !&4003=0
  310 :
  320 CALL memfac1
  330 FOR loop=0 TO 7
  340 READ byte$
  350 PRINT byte$;~base?loop
  360 NEXT
  370 :
  380 DATA "SIGN       :","OVERFLOW  :","
EXPONENT  :"
  390 DATA "MANTISSA1 :","MANTISSA2 :","
MANTISSA3 :"
  400 DATA "MANTISSA4 :","ROUNDING  :"
```

```
>RUN
SIGN       :D1
OVERFLOW   :0
EXPONENT   :8A
MANTISSA1  :D1
MANTISSA2  :40
MANTISSA3  :0
MANTISSA4  :0
ROUNDING   :0
```

Result of running program 1, showing storage of &345 within FAC1

```
>RUN
      4020  84
      4021  10
      4022  0
      4023  0
      4024  0
```

Result of running program 2. Referring to table 2, you can see that the result of addition is 9.00

```
>RUN
      4020  83
      4021  20
      4022  0
      4023  0
      4024  0
```

Result of running program 3. Referring to table 2, you can see the result of subtraction is 5.00

Program 2. Illustrates how floating point addition can be used, using Basic ROM calls, here adding 1.00 to 8.00

```
   10 REM Floating Point Addition
   20 REM Bruce Smith
   30 REM For the BBC Micro
   40 REM (C) Acorn User November 1984
   50 :
   60 P%=&C00
   70 [OPT 2
   80 .floatadd
   90 LDA &70     \ get lo.addr fp1
  100 STA &4B     \ save in fp vector
  110 LDA &71     \ get hi.addr fp1
  120 STA &4C     \ save in fp vector
  130 JSR &A3B5   \ transfer to FAC1
  140 LDA &72     \ get lo.addr fp2
  150 STA &4B     \ save in fp vector
  160 LDA &73     \ get hi.addr fp2
  170 STA &4C     \ save in fp vector
  180 JSR &A500   \ fp addition routine
  190 LDA &74     \ get lo.addr fp result
  200 STA &4B     \ save in fp vector
  210 LDA &75     \ get hi addr fp result
  220 STA &4C     \ save in fp vector
  230 JMP &A38D   \ move FAC1 into fp res
ult
  240 ]
  250 :
  260 !&70=&4000
  270 !&72=&4010
  280 !&74=&4020
  290 :
  300 REM ** SET UP FP 1.00 **
  310 ?&4000=&81:!&4001=0
  320 REM ** SET UP FP 8.00 **
  330 ?&4010=&84:!&4011=0
  340 REM ** CLEAR RESULT AREA **
  350 ?&4020=0:!&4021=0
  360 :
  370 CALL floatadd
  380 FOR N=&4020 TO &4024
  390 PRINT~N;"   ";~?N
  400 NEXT
```

Program 3. Illustrates how floating point subtraction can be used, using Basic ROM calls, here subtracting 2.00 from 7.00

```
   10 REM Floating Point Subtraction
   20 REM Bruce Smith
   30 REM For the BBC Micro
   40 REM (C) Acorn User November 1984
   50 :
   60 P%=&C00
   70 [OPT 2
   80 .floatsub
   90 LDA &70     \ get lo.addr fp1
  100 STA &4B     \ save in fp vector
  110 LDA &71     \ get hi.addr fp1
  120 STA &4C     \ save in fp vector
  130 JSR &A3B5   \ transfer to FAC1
  140 LDA &72     \ get lo.addr fp2
  150 STA &4B     \ save in fp vector
  160 LDA &73     \ get hi.addr fp2
  170 STA &4C     \ save in fp vector
  180 JSR &A4FD   \ fp subtraction
  190 LDA &74     \ get lo.addr fp result
  200 STA &4B     \ save in fp vector
```

Continued ►

◀ Continued

```
  210 LDA &75     \ get hi addr fp result
  220 STA &4C     \ save in fp vector
  230 JMP &A38D   \ move FAC1 into fp res
ult
  240 ]
  250 :
  260 !&70=&4000
  270 !&72=&4010
  280 !&74=&4020
  290 :
  300 REM ** SET UP FP 2.00 **
  310 ?&4000=&82:!&4001=0
  320 REM ** SET UP FP 7.00 **
  330 ?&4010=&83:?&4011=&60:!&4012=0
  340 REM ** CLEAR RESULT AREA **
  350 ?&4020=0:!&4021=0
  360 :
  370 CALL floatsub
  380 FOR N=&4020 TO &4024
  390 PRINT~N;"  ";~?N
  400 NEXT
```

Program 4. How floating point multiplication can be used, using Basic ROM calls, here multiplying 3.00 by 2.00

```
>
   10 REM Floating Point Multiplication
   20 REM Bruce Smith
   30 REM For the BBC Micro
   40 REM (C) Acorn User November 1984
   50 :
   60 P%=&C00
   70 [OPT 2
   80 .floatmult
   90 LDA &70     \ get lo.addr fp1
  100 STA &4B     \ save in fp vector
  110 LDA &71     \ get hi.addr fp1
  120 STA &4C     \ save in fp vector
  130 JSR &A3B5   \ transfer to FAC1
  140 LDA &72     \ get lo.addr fp2
  150 STA &4B     \ save in fp vector
  160 LDA &73     \ get hi.addr fp2
  170 STA &4C     \ save in fp vector
  180 JSR &A656   \ fp multiplication
  190 LDA &74     \ get lo.addr fp result
  200 STA &4B     \ save in fp vector
  210 LDA &75     \ get hi addr fp result
  220 STA &4C     \ save in fp vector
  230 JMP &A38D   \ move FAC1 into fp res
ult
  240 ]
  250 :
  260 !&70=&4000
  270 !&72=&4010
  280 !&74=&4020
  290 :
  300 REM ** SET UP FP 2.00 **
  310 ?&4000=&82:!&4001=0
  320 REM ** SET UP FP 3.00 **
  330 ?&4010=&82:?&4011=&40:!&4012=0
  340 REM ** CLEAR RESULT AREA **
  350 ?&4020=0:!&4021=0
  360 :
  370 CALL floatmult
  380 FOR N=&4020 TO &4024
  390 PRINT~N;"  ";~?N
  400 NEXT
```

Program 5. How floating point division can be used, using Basic ROM calls, here dividing 3.00 by 2.00

```
>
   10 REM Floating Point Division
   20 REM Bruce Smith
   30 REM For the BBC Micro
   40 REM (c) Acorn User November 1984
   50 P%=&C00
   60 [OPT 2
   70 .floatdiv
   80 LDA &70     \ get lo.addr fp1
   90 STA &4B     \ save in fp vector
  100 LDA &71     \ get hi.addr fp1
  110 STA &4C     \ save in fp vector
  120 JSR &A3B5   \ transfer to FAC1
  130 LDA &72     \ get lo.addr fp2
  140 STA &4B     \ save in fp vector
  150 LDA &73     \ get hi.addr fp2
  160 STA &4C     \ save in fp vector
  170 JSR &A6AD   \ fp division
  180 LDA &74     \ get lo.addr fp result
  190 STA &4B     \ save in fp vector
  200 LDA &75     \ get hi..addr fp resul
t
  210 STA &4C     \ save in fp vector
  220 JMP &A38D   \ move FAC1 to fp resul
t
  230 ]
  240 :
  250 !&70=&4000
  260 !&72=&4010
  270 !&74=&4020
  280 :
  290 REM ** SET UP FP 2.00 **
  300 ?&4000=&82:!&4001=0
  310 REM ** SET UP FP 3.00 **
  320 ?&4010=&82:?&4011=40:!&4012=0
  330 REM ** CLEAR RESULT AREA **
  340 ?&4020=0:!&4021=0
  350 :
  360 CALL floatdiv
  370 FOR N=&4020 TO &4024
  380 PRINT~N;"  ";~?N
  390 NEXT
```

```
>RUN
        4020  81
        4021  28
        4022  0
        4023  0
        4024  0
```

Result of running program 5. Here the answer is 1.5 – we leave you to transform the representation back into binary

```
>RUN
        4020  83
        4021  40
        4022  0
        4023  0
        4024  0
```

Result of running program 4. Table 2 indicates that the result is 6.00

See page 113


```
10 REM ** SET MARGIN ON EPSON/STAR
20 OSWRCH=&FFEE
30 WRCHV=&20E
40 vector=256*?(WRCHV+1)+?WRCHV
50 margin=7 : WIDTH(79-margin)
60 FOR PASS=0 TO 3 STEP 3
70 P%=&70
80 [OPT PASS
90 .START
100 LDA #test MOD 256
110 STA WRCHV
120 LDA #test DIV 256
130 STA WRCHV+1
140 RTS
150 .test
160 CMP #13
170 BNE exit
180 JSR exit
190 LDA #&20
200 LDX #margin-1
210 .times
220 JSR OSWRCH
230 DEX
240 BNE times
250 .exit
260 JMP vector
270 ]
280 NEXT PASS
290 CALL START
```

Listing 1. David Prideaux's routine for indented listings

```
10 FOR A%=0 TO 2 STEP 2
20 P%=&900
30 [OPT A%
40 BCC over
50 LDA #138 : LDX #0
60 .LOOP
70 LDY data,X : CPX #&FF :BEQ over
80 INX : STX &70 : LDX #0
90 JSR &FFF4 : LDX &70
100 BNE LOOP
110 .over
120 RTS
130 .data
140 EQUS "OLD"+CHR$13
150 EQUS "RUN"+CHR$13
160 EQUB &FF
170 ]: NEXT A%
180 !&287=&9004C
```

Listing 2. Routine by S Danesh to program the Break key permanently as a function key (OS 1.2)

```
10 REM"B.ALTREPL"  Program to replace dual
20 REM"catalogue utility for discs
30 REM"Acorn User Oc83:47, amendments D83:157
40 REM"COPYRIGHT 1983 N. Pendleton
50 REM"Syntax: *ALT <drv>    Mod by MFP 14Je84
60 :
70 DIM X% 10
80 inst=&0CD0
90 dv = &10CB
100 buf1=&09
110 buf2=&0E
120 osargs=&FFDA
130 osword=&FFF1
140 REPEAT
150 REPEAT
160 INPUT'''"Which drive? "drv
170 UNTIL drv<4 AND drv>-1
180 $X%="DRIVE"+STR$(drv)
190 Y%=X% DIV 256
200 CALL &FFF7 : REM oscli
210 *CAT
220 REPEAT
230 INPUT'"Proceed? "y$
240 UNTIL y$="Y" OR y$="N"
250 IF y$="N" THEN 150
260 ?inst=drv
270 FOR pass=0 TO 2 STEP 2
280 P%=&0C00
290 PROCalt
300 NEXT pass
310 *ACCESS ALT
320 *SA. ALT 0C00 0CFF
330 *ACCESS ALT L
340 UNTIL FALSE
350 END
360 :
370 DEF PROCalt
380 [OPT pass
390 LDA dv: \ Preserve current drive no.
400 PHA
410 LDA #1: \ Collect drive number from typed command
420 LDX #&70: LDY #0: JSR osargs
430 .loop
440 LDA (&70),Y: \ Check for end of command
450 CMP #&D: BEQ params
460 CMP #&34: BPL inc: \ Check for numeral 0 to 3
470 CMP #&30: BMI inc
480 AND #3: STA inst
490 .inc
500 INY: BNE loop
510 .params
520 LDA #0
530 STA inst+1: STA inst+2
540 STA inst+3: STA inst+4
550 LDA #3: STA inst+5
560 LDA #&22: STA inst+9
570 LDA #buf1: STA inst+2
580 LDA #0: STA inst+7
590 STA inst+8
600 LDA #&53: STA inst+6
610 LDA #&7F: LDX #inst MOD 256
620 LDY #inst DIV 256: JSR osword
630 LDA #buf2: STA inst+2
640 LDA #2: STA inst+8
650 LDA #&7F: LDX #inst MOD 256
660 LDY #inst DIV 256: JSR osword
670 LDA #buf1: STA inst+2
680 LDA #&4B: STA inst+6
690 LDA #&7F: LDX #inst MOD 256
700 LDY #inst DIV 256: JSR osword
710 LDA #buf2: STA inst+2
720 LDA #0: STA inst+8
730 LDA #&7F: LDX #inst MOD 256
740 LDY #inst DIV 256: JSR osword
750 PLA: STA dv: \ Recover original drive
760 RTS: ]
770 ENDPROC
```

Listing 3. M F Park's modification to Nigel Pendleton's dual catalogue program, allowing you to specify which drive you want the *ALT command to affect

See 'ROM-con Trick', page 119



David Blakey's 'ROM-con' program allows you to select and access any ROM, even when you've got a full load of ROMs on-board

```
   10 REM********************************
   20 REM* Sideways ROM selector        *
   30 REM*      for BBC micro           *
   40 REM*  (c) Acorn User Nov 84       *
   50 REM*       by D Blakey            *
   60 REM********************************
  100 MODE 7
  110 PROCinit
  120 PROCheader
  130 PROCassemble
  140 PROCfind_basic
  150 PRINT
  160 PROCget_data
  170 PROCread_rom_table
  180 REPEAT
  190 PROCwrite_screen
  200 PRINT TAB(4);"Toggle state of ROM No. ";STRING$(80," ");CHR$11;CHR$11;:INPUT reply$
  210 PROCedit
  220 UNTIL reply$="E" OR reply$="e"
  230 PROCupdate_rom_table
  240 PRINT TAB(4);CHR$11;"Press 'B' for protect, else any key "
  250 A$=GET$
  260 IF A$="B" OR A$="b" THEN PROCset_up_break
  270 END
 1000 :
 1010 DEF PROCassemble
 1020 FOR PASS=0 TO 2 STEP 2
 1030 P%=code
 1040 [OPT PASS
 1050.start
 1060 STA rom_address
 1070 LDA #&80
 1080 STA &71
 1090 LDA #0
 1100 STA &70
 1110 LDY #7
 1120 LDA (&70),Y
 1130 STA &70
 1140 LDY #2
 1150 LDA (&70),Y
 1160 LDY #8
 1170 CMP #ASC"C"
 1180 BNE no_rom
 1190.loop
 1200 INY
 1210 LDA rom,Y
 1220 BEQ found_end_word
 1230 STA string,Y
 1240 JMP loop
 1250.found_end_word
 1260 LDA #&0D
 1270 STA string,Y
 1280 LDA rom+6
 1290.end
 1300 STX rom_address
 1310 RTS
 1320.no_rom
 1330 INY
 1340 LDA #&0D
 1350 STA string,Y
 1360 LDA #0
 1370 JMP end
 1380 ]
 1390 P%=&A00 :REM P%=&D00 FOR TAPE
 1400 [OPT PASS
 1410.break_handler
 1420 LDY #16
 1430.more_data
 1440 DEY
 1450 LDA data,Y
 1460 STA &2A1,Y
 1470 TYA
 1480 BNE more_data
 1490 RTS
 1500.data
 1510 ]
 1520 NEXT
 1530 ENDPROC
 1540 :
 1550 DEF PROCfind_basic
 1560 A%=252:X%=0:Y%=&FF
 1570 X%=(USR(osbyte) AND &FF00)DIV 256
 1580 ENDPROC
 1590 :
 1600 DEF PROCinit
 1610 DIM title$(16),select$(16)
 1620 DIM type%(16),control%(16)
 1630 DIM code 255
```

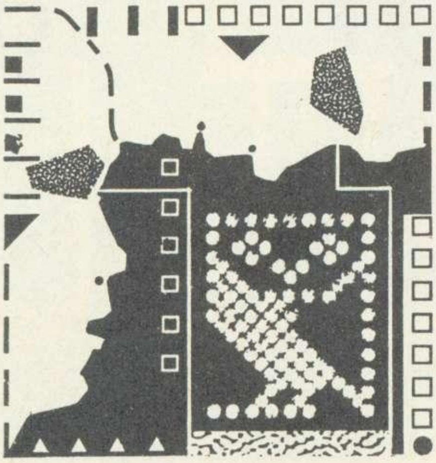
Continued ►

See 'ROM-con Trick', page 119

◄ *Continued*

```
 1640 rom_numbers=4:REM TOTAL no. ROMs
 1650 rom_address=&FE30
 1660 rom=&8000
 1670 string=&0900
 1680 osbyte=&FFF4
 1690 *FX 247
 1700 ENDPROC
 1710 :
 1720 DEF PROCget_data
 1730 FOR A%=(16-rom_numbers) TO 15
 1740 type%(A%)=(USR(start) AND &FF)
 1750 title$(A%)=$(string+9)
 1760 NEXT
 1770 ENDPROC
 1780 :
 1790 DEF PROCwrite_screen
 1800 PRINT TAB(0,4);CHR$131;CHR$157;CHR
$129;
 1810 PRINT TAB(3);"No.";TAB(8);"Title";
TAB(23);"State";TAB(33);"Type"
 1820 FOR I%=0 TO 15
 1830 PRINT TAB(3);I%;TAB(8);title$(I%);
TAB(23);select$(I%);TAB(33);~type%(I%)
 1840 NEXT
 1850 PRINT CHR$131;CHR$157;CHR$129;
 1860 ENDPROC
 1870 :
 1880 DEF PROCread_rom_table
 1890 FOR I%=0 TO 15
 1900 control%(I%)=I%?&2A1
 1910 IF control%(I%)=type%(I%) AND type
%(I%)<>0 THEN select$(I%)="ON " ELSE sel
ect$(I%)="OFF"
 1920 NEXT
 1930 ENDPROC
 1940 :
 1950 DEF PROCheader
 1960 FOR I%=0 TO 3
 1970 PRINT TAB(0,I%);CHR$129;CHR$157;CH
R$131
 1980 NEXT
 1990 PRINT TAB(9,0);CHR$141;"SIDEWAYS R
OM CONTROL"
 2000 PRINT TAB(9,1);CHR$141;"SIDEWAYS R
OM CONTROL"
 2010 PRINT TAB(11,2)"(c) Acorn User 198
4 - by David Blakey
 2020 PRINT TAB(3,3)"Enter 'E' to exit"
 2030 ENDPROC
 2040 :
 2050 DEF PROCedit
 2060 W%=VAL(reply$)
 2070 IF W%>16 THEN ENDPROC
 2080 IF (W%=0 AND ASC(reply$)<>48) OR t
itle$(W%)="" THEN ENDPROC
 2090 IF control%(W%)=0 THEN control%(W%
)=type%(W%):select$(W%)="ON " ELSE contr
ol%(W%)=0:select$(W%)="OFF"
 2100 ENDPROC
 2110 :
 2120 DEF PROCupdate_rom_table
 2130 FOR I%=0 TO 15
 2140 I%?&2A1=control%(I%)
 2150 I%?data=control%(I%)
 2160 NEXT
 2170 ENDPROC
 2180 :
 2190 DEF PROCset_up_break
 2200 A%=249:Y%=0:X%=break_handler DIV 2
56:CALL osbyte
 2210 *FX248,0
 2220 *FX247,76
 2230 ENDPROC
```





Bruce Smith presents a bundle of useful tips: a sprite definer look-up table, a word processing aid and other bright Beeb ideas

Colour chart for the sprite designer

£20

A PORTRAIT of Bill Shakespeare is winging its way to B Gabel of Lewes for his useful multicolour chart (table 1). Mr Gabel writes...

Having read and typed in Mr Sinclair's excellent sprite definer (September issue) I drew up the following pixel colour chart. It has been indispensable to me ever since and should be for other programmers.

The colours referred to are the logical colours in mode 2. To see what number to send to the screen byte, look up the colour of the left-hand pixel on the grid's 'Left Pixel' section and the colour of the right-hand pixel on the grid's 'Right Pixel' section. Follow the row and column across and down until they meet. The number in the square is the number you want (in hexadecimal).

For example: for a byte coloured yellow on the left and flashing blue/yellow on the right, the number is &5A. Try it: type

?&5000 = &5A

...Suitable remuneration awaits any would-be statisticians who supply useful charts such as this!

Auto-numbering in View

£5

USEFUL advice on how to write programs without line numbers using *View* or *Wordwise* comes from J C Clarke of Nettleton. Mr Clarke explains that you simply type in your program without line numbers and when you have finished inset a line at the beginning of the file that contains AUTO. Now save the file to disc. To get the program into its proper form simply *EXEC the file into Basic memory. When AUTO, the first line on the file, is executed it will add a line number to each line that is loaded in from disc.

Thanks to Mr Clarke for pointing this out.

I often use a similar method for converting machine code back into assembler form. First I set up a *SPOOL file and then disassemble the section of code to be converted – this is spooled to disc. Once the file has been closed, by using *SPOOL again, it can be loaded into *Wordwise* or *View*, where AUTO can be added to the top of the file which can be re-saved. Now simply *EXEC the file to obtain your assembler program, ready for editing!

Mr Clarke also points out that the function keys can be programmed as normal in *View* by first executing *FX228,1. Key definitions are entered as normal and then accessed using the Shift/CTRL key combination.

Indenting the printout

£5

HERE's a useful printer utility for the Epson/Star range. It comes from David Prideaux of Plymouth, who writes...

An irritating failing of the Epson MX range of printers is the lack of a facility to define the left margin. It is possible

LEFT PIXEL / COLOUR	RIGHT PIXEL: Black	Red	Green	Yellow	Blue	Magenta	Cyan	White	Black/White (FLASHING)	Red/Cyan	Green/Magenta	Yellow/Blue	Blue/Yellow	Magenta/Green	Cyan/Red	White/Black
Black	00	01	04	05	10	11	14	15	40	41	44	45	50	51	54	54
Red	02	03	06	07	12	13	16	17	42	43	46	47	52	53	56	57
Green	08	09	0C	0D	18	19	1C	1D	48	49	4C	4D	58	59	5C	5D
Yellow	0A	0B	0E	0F	1A	1B	1E	1F	4A	4B	4E	4F	5A	5B	5E	5F
Blue	20	21	24	25	30	31	34	35	60	61	64	65	70	71	74	75
Magenta	22	23	26	27	32	33	36	37	62	63	66	67	72	73	76	77
Cyan	28	29	2C	2D	38	39	3C	3D	68	69	6C	6D	78	79	7C	7D
White	2A	2B	2E	2F	3A	3B	3E	3F	6A	6B	6E	6F	7A	7B	7E	7F
Black/White (FLASHING)	80	81	84	85	90	91	94	95	C0	C1	C4	C5	D0	D1	D4	D5
Red/Cyan	82	83	86	87	92	93	96	97	C2	C3	C6	C7	D2	D3	D6	D7
Green/Magenta	88	89	8C	8D	98	98	9C	9D	C8	C9	CC	CD	D8	D9	DC	DD
Yellow/Blue	8A	8B	8E	8F	9A	9B	9E	9F	CA	CB	CE	CF	DA	DB	DE	DF
Blue/Yellow	A0	A1	A4	A5	B0	B1	B4	B5	E0	E1	E4	E5	F0	F1	F4	F5
Magenta/Green	A2	A3	A6	A7	B2	B3	B6	B7	E2	E3	E6	E7	F2	F3	F6	F7
Cyan/Red	A8	89	AC	AD	B8	B9	BC	BD	E8	E9	EC	ED	F8	F9	FC	FD
White/Black	AA	AB	AE	AF	BA	BB	BE	BF	EA	EB	EE	EF	FA	FB	FE	FF

Table 1. Mode 2 pixel/byte colour chart for the Electron and BBC micro

Beeb Forum is a platform for ideas, tips and applications relating to the BBC micro and the Electron, intended for experienced programmers to share their thoughts. For every reader's tip published we pay £5 – or more for something special. Contributions should be typed or printed, with substantial listings on cassette. WRITE TO Beeb Forum, Acorn User, Redwood Publishing, London WC2E 9JH.

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when running under program control to format the output as desired, and obviously a wordprocessor program normally includes such a feature, but what I am referring to is the ability simply to produce a listing of a program, for example, indented by an amount so that when inserted in a binder the print may still be read.

The short routine attached (listing 1) is my answer to the problem. It works by intercepting the OSWRCH vector to scan the output stream looking for the <RETURN> character – which occurs at the end of every line or when the WIDTH limit is reached. After the <RETURN> the routine inserts a number of spaces up to the specified margin width and then carries on printing until the next <RETURN>, when it repeats the process.

As written, the routine should work on any OS since, although the return address (vector) depends on the OS version, it is read from WRCHV, which is common to all versions. The code has to be located out of the way of the Basic program: I have found no problems with it in zero page at &0070, which is provided as user workspace.

£5 Save memory space on disc

EVEN with a dual catalogue utility the number of files that can be stored on a disc can be limiting, especially on a games disc where many small files are sometimes used purely to CHAIN another larger file. S Danesh of Southampton has found an efficient way around this problem. I'll let him explain...

One of the main disadvantages of the Acorn DFS is the limitation of allowing only a maximum of 31 files per disc. This can mean large amounts of disc memory being wasted simply because the disc catalogue has become full.

This problem is magnified when programs are in several parts. One method of relieving this problem is to merge parts of a program together. To do this, the reason why several parts are needed has to be understood.

Machine code programs transferred from tape are usually in three parts. The first simply sets 'PAGE' to a high value and then CHAINs the second part. This then *LOADs the main machine code program and downloads it to its correct position in memory.

At first sight, the first program may seem unnecessary since all it does is to change the value of PAGE. But this is essential since PAGE determines where the next program will be loaded in memory. If this value is too low then the third program will simply overwrite the second one and the program will not work.

If there was a way to achieve this end without the need for an extra file, more programs could be stored on a disc.

This is achieved by CHAINing the downloader (ie, the second program) at the default PAGE setting (ie &1900). Now, if the program were to *LOAD the machine code program, it would be overwritten. So the first thing the routine does is to copy itself higher up in the memory and then to proceed normally. This is done by adding lines 10 to 40 of the following program to the downloader:

```
10 FOR A%=PAGE TO TOP STEP 4
20 A%!&4000=!A%
30 NEXT A%
40 PAGE=PAGE+&4000 : GOTO 50
50 *LOAD XXXX
60 PROCdownload
.        .
.        .
.        .
```

Lines 10 to 30 create a copy of the program &4000 bytes higher up in memory and line 40 transfers program execution to the new location.

Line 50 loads the machine code program called XXXX and line 60 calls the procedure, which downloads the program in the normal way.

£5 Programming the Break key

MR DANESH also provides a useful routine that allows the Break key to be programmed permanently as a function key by writing to the Break intercept vector. Again, Mr Danesh can best explain...

One of the most common uses of the Break function key is to program it to OLD and then to RUN by treating it as function key 10 (page 143, *User Guide*):

```
*KEY 10 OLD ¦ M RUN ¦ M
```

The drawback with this method is that it is by-passed if the CTRL key is pressed simultaneously with the Break key, since this causes a hard reset.

However, users with the 1.2 MOS can treat the Break as a function key even after a hard break by typing in the program in listing 2.

When Break is pressed, the OS checks memory location &287 to see if it contains the value &4C. If it does, then it jumps to the address held in memory locations &288 and &289. Thus a routine can be written that puts the necessary characters into the keyboard buffer.

Line 40 is necessary because the OS calls this routine twice, once with carry clear and once with carry set. But we want the routine to be executed once only, so if carry is clear the routine is not carried out.

Line 50 initialises the accumulator and the x register for a sequence of OSBYTE calls to insert the necessary characters into the keyboard buffer.

The data lines contain the characters to be inserted. These can be anything the user wants, as long as it ends with the end of data marker '&FF'.

Note that the commands 'EQUS' and 'EQUB' are available only in Basic 2. The equivalent Basic 1 method would be to delete the data lines, and add:

```
180$data="OLD"+CHR$13
   +"RUN"+CHR$13+CHR$&FF
```

£5 Dual catalogue modification

JUDGING by the number of people who brought dual catalogue discs to the Acorn User Clinic at Olympia in August, Nigel Pendleton's dual catalogue utility published in the October 83 *Acorn User* was a hit with disc users. This modification, supplied by M F Park of Hastings, New Zealand, allows you to specify which drive you wish to affect. Mr Park says...

Suppose you are using drive 0 and want to see what is on the alternative catalogue of drive 2. This modification (listing 3) lets you type *ALT 2, then type *.2 to see what's there. Typing *ALT swaps catalogues on the current drive.

The modification works by saving the current drive number (held at address &10CB) on the 6502 stack and calling OSARGS to see whether there's a numeral following the command *ALT. If not, the preset drive number in the code is used to select the drive on which ALT is to work. This is called a default option.

If there is a numeral from 0 to 3 following the *ALT command (note that the command must be followed by a space) this is substituted for the default setting in the code to select the drive.

After ALT has done its work, the original drive number is removed from the stack and restored to its original location. I find it useful to assign a function key thus:

```
*KEY 7 *ALT<space>
```

Program n, will allow you to revise your present copy of *ALT.

See yellow page 110 for programs 1–3

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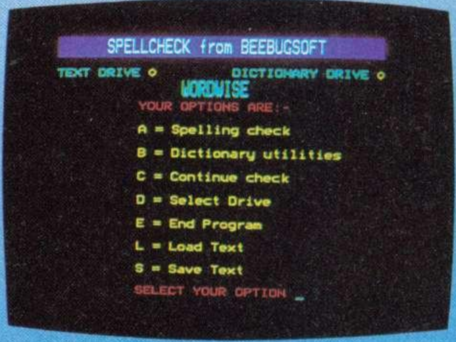
One extra feature of the disc version is that it provides limited spreadsheet facilities.



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PCN NOVEMBER 1984

SPELLCHECK



SPELLCHECK is menu driven, and is the ideal companion for WORDWISE or VIEW. It provides an automatic spelling check for letters or documents.

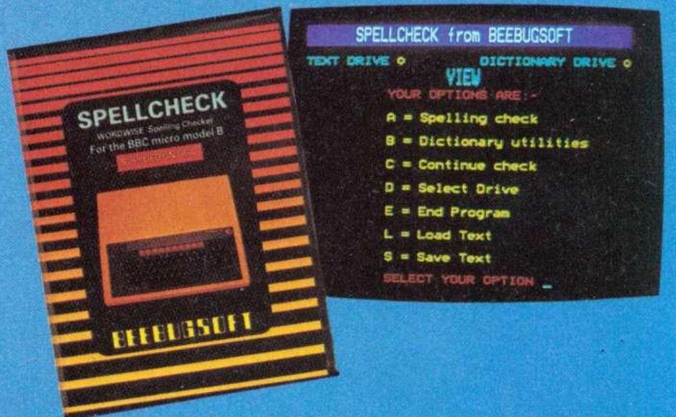
It is supplied with a dictionary disc already containing 6000 words, which may be increased to a maximum of about 17,000 words on a 100K disc.

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ROM-CON TRICK

David Blakey's program lets you juggle 16 ROMs without dropping any



ONE of the most powerful features of the BBC micro is the ability to have software present in ROM chips and be able to juggle up to 16 of them in just one 16k block of memory, from location &8000 to &BFFF. This enables languages, utilities and other software to be available at all times without the need for a storage medium.

The ROMs are called up via the operating system using commands such as *BCPL, *BASIC and *WORDWISE. But as these ROMs can come from different software houses, the commands to call them up can often clash; *MOVE and *EDIT, for example, are utilities common to several ROMs. As the OS offers these commands in turn to each ROM until one of them accepts it, a utility in a low-priority ROM position may never be accessed.

The advent of ROM boards enabling up to 16 ROMs to be resident in the machine only makes matters worse. Thus a program that enables these ROMs to be switched off via software offers the user full access to all his or her software. My *ROM-con* utility enables ROMs to be switched off even after a Break or a Control Break.

Location &FE30 of the BBC micro is the control register for ROM selection. Careless writing to this register from Basic will generally result in a crash, as the Basic ROM itself may be deselected. Basic cannot therefore access the paged ROMs by itself; it normally passes commands to the OS to perform this task. Thus in the *ROM-con* program a machine code routine interfaces Basic with the other ROMs.

To enter the routine at 'start', two parameters are passed to it, A% containing the ROM that is to be interrogated and X% the socket number containing Basic. The routine first checks to see if there is a ROM in the socket chosen. It does this by checking for part of the copyright symbol, (C). If this is not present it exits back to Basic returning null data, but if a ROM is present it passes back to Basic the title of the ROM and its ROM type-number.

The OS holds a table of type-numbers for each of the 16 ROM sockets in locations &2A1 to &2B0. A zero indicates that there is no ROM present in that particular socket. What *ROM-con* does is set up its own table in which the value of any socket can be set to zero, thus turning off that particular ROM.

You can now input the ROMs that you require to be deselected. Entering 'E' will exit the program and give you the option of break-protection, which updates the OS ROM table with your edited version whenever Break or Control Break is pressed. If this option is not used, all ROMs will be turned on again when Break is pressed.

The break-protection system uses the *FX247,76 command to set up a JMP opcode at location &287. Commands *FX 248 and *FX 249 pass further data to locations &288 and &289. The opcode at &287 will now read 'JMP break-handler'. Now when the Break key is pressed the OS tests location &287 for a JMP command; if present it executes the opcode, and passes through the user provided routine at &A00. The OS will pass through this routine twice – the first time the carry bit will be clear, the second time it will be set. The routine at &A00 ignores the carry bit.

The effect of this is to call the routine before and after the OS reads the ROMs. So when a ROM is deselected it is not allowed to reserve memory space for its own use. This is best shown by deselecting your DFS (if you are lucky enough to own one) and pressing Break. PAGE will now be set to &E00 rather than &1900. This is equivalent to taking a screwdriver to your computer and removing the ROM from its socket. To switch any of the ROMs back on, either re-run the utility and reselect the ROM or issue a *FX247 command and press Break. This removes the break-handler routine and allows the OS to create a new ROM table list.

Basic has a special relationship with the operating system, which explains why the ROM cannot be 'seen' by using the *HELP command. But it is possible to switch off Basic by editing the ROM out of the system, using the break-protection system and then pressing Control Break. Basic will now be turned off and the next language ROM selected. If no further language ROMs are found the OS responds with the message 'Language?'. Pressing Break will release the situation. Armed with this utility, it is possible to have Basic 1 and Basic 2 as well as several DFSs resident in the machine at the same time.

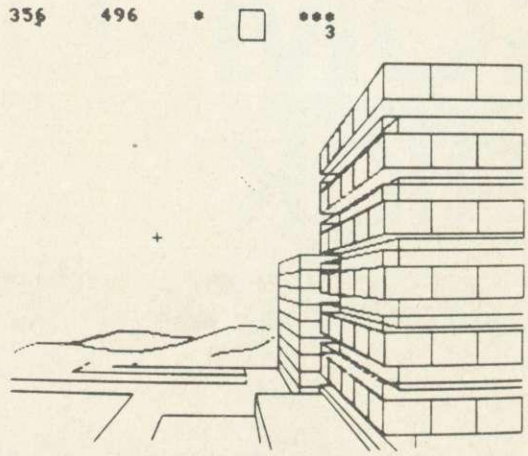
A word of caution. If any software is allowed to overwrite the break-handler routine at &A00, the machine will probably lock up when Break is pressed. The cure is to move the routine to a new location (ie change line 1390) or issue a *FX247 command before running the offending software.

The program has been tested in a micro fitted with a 12-ROM socket expansion board, giving 16 ROMs in all, so it should work with any of the current ROM expansion boards. Line 1640 of the program should be altered according to the number of ROM sockets in your system. Immediately after typing in the program save a copy, as any mistakes in entry could cause a system crash. Pay particular attention to the assembly language routines. For test purposes do not use the break-protection system until you have proved that each of the ROMs can be turned off. After running the program, *HELP will show if you have been successful.

See yellow pages 111-112 for the listing of David Blakey's 'ROM-con' utility

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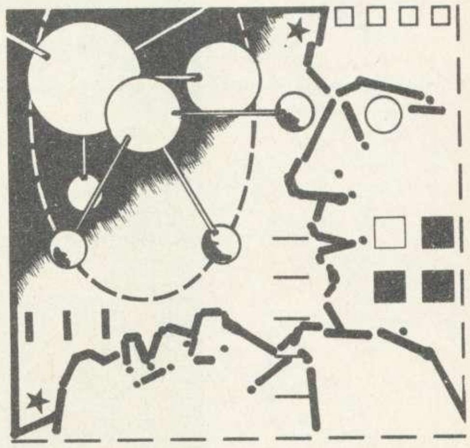
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Dashing away with a soldering iron this month as Barry Pickles introduces readers' hardware mods, starting with model trains

£10 Points, signals and buffers

N J TUBB of Crawley is a hobbyist who combines two enthusiasms neatly. He knew nothing about computing before he bought an Atom kit in 1981, but since then he has 'expanded it to 120k, increased the number of ports, partly rewritten the Atom ROM, expanded the Basic etc to 48k, added a battery back-up power unit . . .'

He uses the system to run a model railway, and he wanted more ports for the Atom to control the points and signals.

This is how he went about the task . . .

By using a couple of 74138s, half of a 7402, and all the 8255s I could afford (15), I can control up to 360.

Connect a wire to pin 12 of the 74138. IC23 is the only internal modification needed – all other connections can be taken from the normal buses. Note that, as shown in figure 1, pin 15 of the top 74138 should not be used, as this address is used by the keyboard. Also, as I wanted only output ports, all the 8255's pins 5 are taken to 5V+, and all pins 36 taken to ground.

If you require general usage of the ports, connect pins 5 and 36 of the 8255s to NRDS and NWDS respectively (through buffers, of course). Also, you will need to cut the connection between pin 4 of IC49 and pin 6 of IC25 and reconnect pin 6 of IC25 to pin 15 of the top 74138 below . . .

Mr Tubb thought it was about time he threw in his 'two penn'orth'. We can do better than that – here's a tenner, Mr Tubb.

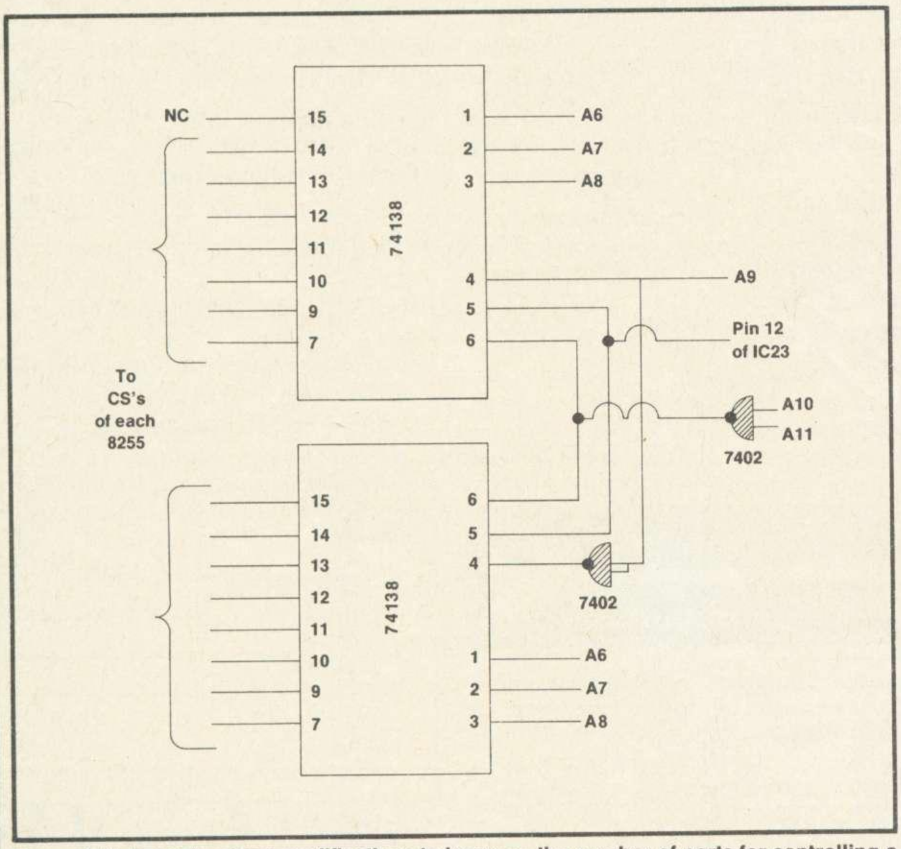


Figure 1. N J Tubb's wiring modifications to increase the number of ports for controlling a model railway system

Invented a routine or discovered a hardware modification for the Atom? Here's a chance to show your originality and win some cash. Send your idea to: Atom Forum, Acorn User, Redwood Publishing, 68 Long Acre, London WC2 9JH.

£5 Auto-reset on power-up

ANOTHER hardware mod this month. It comes from John Alan Ferguson of Chelmsford, who wins £5, and it provides auto-reset on power-up. John writes . . .

Like many Atom owners I've always been puzzled as to why the machine does not have reset on power up. My machine and others I have seen display only random characters when power is applied and the Break key has to be pressed to obtain the words ACORN ATOM and the prompt.

Looking at the circuit diagram I noticed that there is a capacitor No C11 value 100n between 0 volts and the other side of the Break key. It seems to me that a larger capacitor substituted for this would, due to the delay in charging, pull down the voltage of the CPU reset pin for long enough to reset the machine automatically. After trial and error I found that soldering an electrolitic capacitor valued at 4.7µf in lieu of capacitor C11 gave auto-reset.

To find C11 turn the machine upside-down with the keyboard nearest you and take off the bottom of the machine by unscrewing the two fixing screws. Capacitor C11 is to the left of the break key which is now on the left of the machine. Make sure that the + and − terminals coincide with those marked on the printed circuit board.

It is puzzling that Acorn doesn't seem to have made this minor alteration (I do not accept any responsibility for the alteration as it has not been approved by Acorn). My machine is using about 3 amps. For those machines requiring more or less current different values may be required.

page 123▶



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£10 Adding addressable RAM

HERE's another £10 winner from Mr Tubb. He writes . . .

Fancy a bit of RAM in your A block sometimes? This little modification (figure 2) will show you how (and keep your ROM).

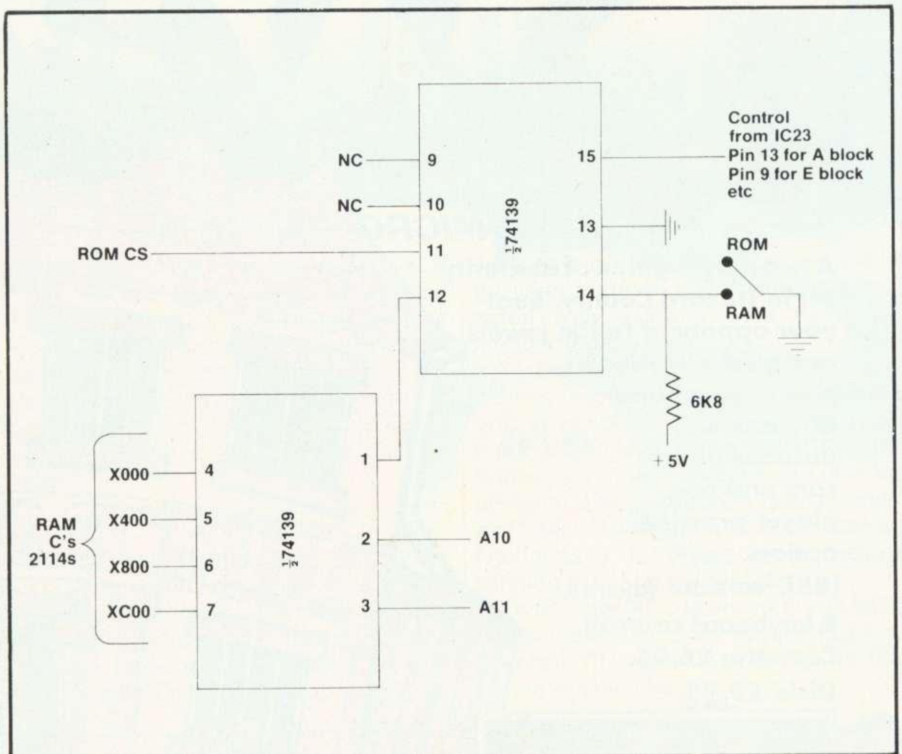


Figure 2. Also from N J Tubb, a modification to add addressable RAM from #A000

£5 Insert your own message

ONE of the annoying things about the Atom's cassette operating system, says G R Pearson of Darlington, is the need for repeatedly pressing the Return key when loading a program that is divided into sections (eg a Basic program, data and some machine code).

The most obvious way to overcome this problem is to alter the 'print message' routine vector in RAM (#218 and #219) but for some reason my Atom doesn't use an indirect jump to the routine via the vector, but jumps straight to the routine.

I therefore wrote the following machine code routine (listing 1) which also allows you to insert your own message instead of the normal PLAY TAPE message. The program can be assembled into any free location by altering line 10.

A brief explanation of the program is as follows:

Line 10 selects the place of assembly.

```
 10 D=#80
 20 FOR J=0 TO 1
 30 P=D
 40 [
 50 PHP
 60 SEI
 70 JSR#F7D1
 80 ]
 90 $P="(C) G.R. PEARSON"
100 P=P+LENP
110 [
120 NOP
140 LDA @ 10;JSR#FE52
150 LDA @ 13;JSR#FE52
160 JSR#F84F
170 PHP
180 JMP#F977
190 ]
200 NEXT J
210 ?#20C=D;?#20D=D/256
```

Listing 1. Machine code facility from G R Pearson for loading a sectionalised program

Lines 50 and 60 are part of the original COS routine.
Line 70 calls routine to print string.
Lines 90 and 100 set up message.
Line 120 signals end of message.
Lines 140 and 150 output carriage return and line-feed.
Lines 160 and 170 are part of the original COS routine.
Line 180 jumps into COS routine.
Line 210 sets up vectors.

If you want the computer to wait for you to press a key insert the following line:

130 JSR#FFE3

To adapt the routine to work with the SAVE command, make the following alterations:

180 JMP#FAF0
210 ?#20E = D;?#20F = D/256

It would be wise to insert line 130 when using it for Saving, otherwise you won't have time to start the cassette recorder and may lose some of your program.

£5 Dancing demo

WHEN I asked for submissions to follow up the 'Disco Fever' routines in last April's Atom Forum, the program in listing 2 wasn't quite what I had in mind. It is, however, an amusing demonstration of mode 0 graphics and R J Adams of Kidderminster, its author, wins £5, if only for his cheek!

```
  5 REM dance
 10 Q=0;DO
 20 F.I=1 TO 4;
    A=?#B002&#20
 30 IF A>0;Q=Q+(A-#1F)
 40 N.I
 50 IF Q=3 GOS.a
 60 IF Q=2 GOS.b
 70 IF Q=1 GOS.c
 80 WAIT;WAIT
 90 Q=0;U.0
100 E.
110aS=#8108;T=S+32;
    U=T+32;CLEAR0
120 !S=#68566420
130 !T=#785F4120
140 !U=#205A5820
150 RETURN
160bS=#8109;T=S+32;
    U=T+32;CLEAR0
170 !S=#58695420
180 !T=#426F7420
190 !U=#64652020
200 RETURN
210cS=#80E8;T=S+32;
    U=T+32;CLEAR0
220 !S=#567C6920
230 !T=#207F2020
240 !U=#65604520
250 RETURN
```

Listing 2. Disco dancing demonstrated by R J Adams



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MISSING LINK

A finishing touch for A to B conversion, by Bruce Smith

THE three-part series by Barry Pickles on how to convert a Beeb program to AtomBasic (May, June and July issues) showed that with a little thought and application many of the more sophisticated commands available with BBC Basic may be implemented on the Atom. The one command missing from Barry's list, however, was AUTO, which provides automatic line numbering, thus taking the tedium out of program entry. This kind of utility is an invaluable aid, allowing you to get on with the job in hand – typing the program in!

The program presented here will provide such a utility. It is written in assembler. The mnemonic text is a little under 1k in length and once assembled into a convenient area of memory, such as the floating point variable space at #2800, occupies just 193 bytes plus four bytes in zero page for address vectors. Enter and run the program, then the object code can be saved with:

*SAVE "AUTO" 2800 28C2 2800

Using *Auto* is simple. Type LINK #2800 (LL0 in source). Line numbers will then be displayed in increments of 5 (ie, 5, 10, 15 etc). If you prefer other multiples change the constants in lines 90 and 300 to the desired values. As each line number is issued enter program text in the usual manner. As each line is terminated with a Return the next line number is displayed.

To exit from *Auto* press Return (displaying the next line number) and then Shift @ (displayed as an inverted @ on the VDU), followed by another Return. Editing and line insertions can now be performed as required. It is vital, however, that the value of TOP is reset by typing END in direct mode before running or listing the program.

To re-enter *Auto* at the point you left it to continue use LINK #289E (LL14 in source). The next line-number in the series will then be displayed.


```
 10 REM ********************************
 20 REM *********  atomatic  *********
 30 REM ********************************
 40 PRINT $21
 50 DIM XX15
 60 FOR N=0 TO 15 ; XXN=-1 ; NEXT
 70 FOR N=1 TO 2  ; P=#2800
 80 [:XX0
 90 LDX @5             LINE NO. INCREMENT
100 STX #80:STX #16    STORE FIRST LINE NO.
110 JSR XX15           INITALISE REGISTERS
120 STX#25:STX#81      AND MEMORY
125 STX#82
130 LDA#12:STA#83      GET TEXT SPACE
140 LDA@13:JSR XX7     STORE CR
150 :XX1
155 LDA #81            STORE HI BYTE
158 JSR XX7            LINE NO.
160 LDA #80            STORE LO BYTE
161 JSR XX7            LINE NO.
170 STY#84             SAVE Y REGISTER
180 JSR #C589          PRINT LINE NOT
190 LDA@32             SPACE PROMPT. READ
191 JSR#CD0F           KEYBOARD TO BUFFER
200 LDY #84            RESTORE Y REGISTER
210 LDX@0              INITALISE X REGISTER
220 :XX2
221 LDA #100,X         READ CHR FROM BUFFER
230 CPX@0;BEQ XX10     IF 1ST CHR, BRANCH
240 :XX3
241 CMP@96              IF '@' (inverted' @
242 BEQ XX11            THEN BRANCH
250 CMP@13              IF CR BUFFER END
251 BEQ XX5
260 :XX4
261 JSR XX7             STORE CR
270 INX:JMP XX2         GET NEXT CHR
280 :XX5
281 JSR XX7             STORE CR
290 LDX #80             LO BYTE LINE NO.
300 CLC:ADC@5           INCREMENT BY 5
310 STA #16:STA#80      STORE BACK
320 BCC XX6             IF CARRY SET
321 INC#81              INCREMENT HI BYTE
330 :XX6
331 LDA#81;STA#25       HI BYTE LINE NO.
340 CMP@#7F            TEST FOR MAX
341 BNE XX1            LINE NUMBER
350 JMP XX12
360 :XX7
361 STA(#82),Y         STORE I/P BUFFER
370 INY:TYA            TEST Y REGISTER IF
380 BEQ XX9:RTS        PAGE NEEDS INC
390 :XX9
391 INC#83:RTS          INC PAGE NO.
400 :XX10
401 CMP@13:BNE XX3      IF I/P ERASE
410 DEY:DEY:DEY         CURRENT LINE NO.
420 JMP XX3
430 :XX1                END OF PROGRAM
431 DEY:DEY             INPUT, ERASE
440 LDA@255             TOP CODE
441 JSR XX7             SET TOP
442 RTS
450 :XX12
451 LDA#80              GET LO BYTE LINE NO.
452 CMP@255             TEST FOR LIMIT
460 BEQ XX13:JMP XX1
470 :XX13
471 JSR XX11            END OF I/P
472 JSR #F7D1           LIMIT. INMFORM USER
480 ]
490 $P="OUT OF NUMBERS "
500 P=P+LENP
510 [ NOP:JSR #FD1A  BLEEP
520 :XX14
521 LDA#80:STA#16     PRINT NEXT LINE
530 LDA#81:STA#25     NUMBER
540 JSR XX15          SET REGISTERS
550 LDA 13            GET LO BYTE &
551 STA#82:DEC#82     SET TOP-1
560 LDA 14            GET HI BYTE &
561 STA #83           SET TOP
570 JMP XX1
580 :XX15
581 LDX@0:LDY@0        INITALISE REG.
590 STX#34:STX#43      INITALISE MEM.
600 STX#321            INITALISE @%
610 RTS:]
620 NEXT N
630 PRINT $6
640 END
```

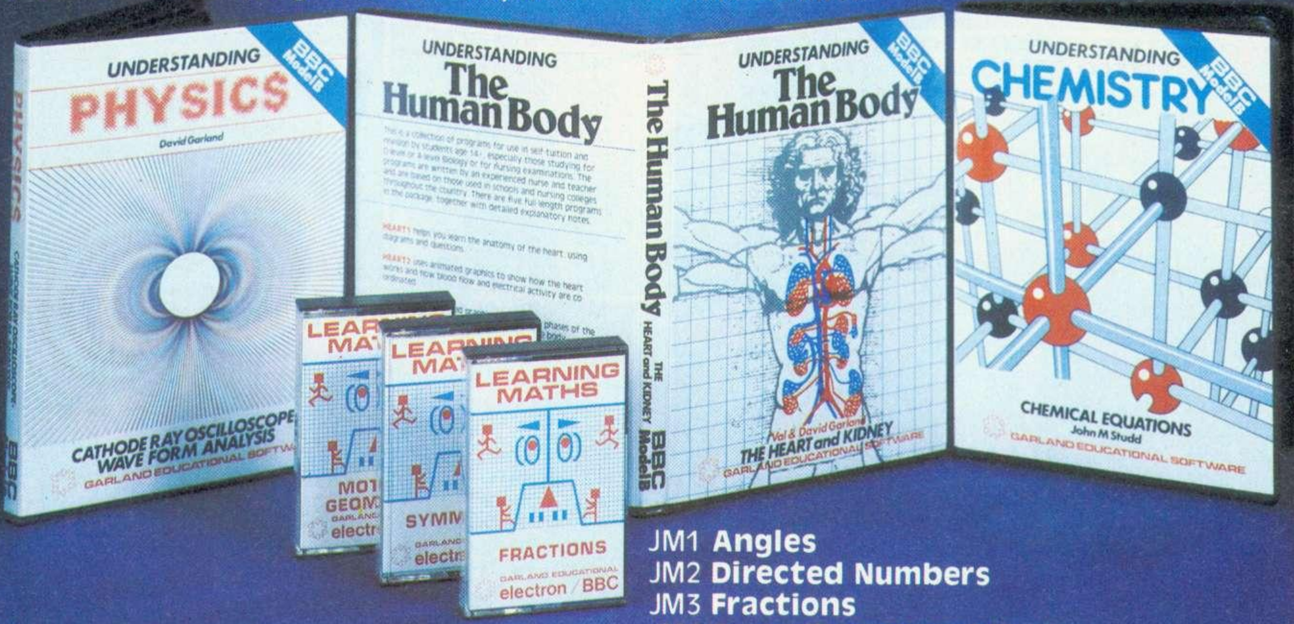
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THIS new feature section, edited by Nick Evans, is a forum for all those involved in education: teachers, lecturers, researchers, software and hardware suppliers – and, of course, students and pupils. It offers you the chance to tell us about classroom projects, what software you'd like others to know about, what hardware you feel you need and what problems you're having with, say, networking.

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We're giving away 10 sets to the schools of the 10 winning pupils in our Geo Quiz competition.

All you have to do is answer correctly the 10 questions listed here. The winning entries will be the first 10 correct solutions to be picked out of a hat.

Answers on a postcard, please, to Geo Quiz, *Acorn User*, Redwood Publishing, 68 Long Acre, London WC2E 9JH, giving your name, age, class, school and school address. Entries should arrive on or before November 23, 1984. Winners will be announced in the January issue of *Acorn User*.

1 In what year did Sir Edmund Hillary and Sherpa Tensing conquer Everest?
2 What is the highest mountain in the United Kingdom? How high is it in metres?
3 Who first flew the Atlantic?
4 How far in kilometres is it from London to Johannesburg?
5 Is a nomadic tribe: warlike, jungle-dwelling or wandering?
6 Do hyenas hunt alone, in packs or in family groups?
7 What word describes a river that flows into a larger one?
8 Is a monsoon: a swamp, a rainy season or a type of boat?
9 Name two deserts in Africa.
10 What is the continent surrounding the South Pole called?



Detail of a screen shot shows the high quality of the Summit simulation's graphics

Radio 4's survival challenge

ACTION-packed geography lessons? That's what is promised by a suite of simulation packages put together by BBC Radio. Produced in conjunction with the Radio 4 school series *Introducing Geography*, the 'Exploring the Environment' programs consist of four dynamic simulations that will challenge the wit, skill and resourcefulness of any 10 to 12-year-old.

Each simulation puts the 'player' into a perilous predicament and the process of winning through turns learning into an exciting adventure.

The four programs – called *River, Flight, Nomad* and *Summit* – come on a set of three discs, costing £20 (inc. VAT).

In *River* the pupil crash-lands his plane in a remote mountain region and has to face realistic problems of survival, seeking out a river and, in an attempt to find civilisation, following its course to the sea – all within a time limit. This program has three levels of difficulty.

Flight also casts the player in the role of a pilot (or his navigator). The challenge is to fly safely across mountains and oceans to a far-off city, recognising the changing features of the terrain below (shown in colour graphics on the screen). Before take-off, pilot and navigator have to do some thorough atlas research, so more than aeronautical skills are involved.

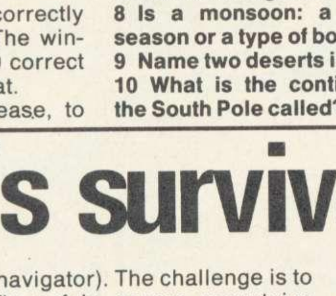
With *Nomad* the problems are not technological but those of survival in the African Savanna. The children 'live' the life of the Faluni, a nomadic tribe who seasonally move their herds north and south in search of good grazing. The player takes the role of a Faluni in charge of 20 head of zebu cattle over a 20-year period and is encouraged to make graphs and charts to report progress.

Surviving the treacherous weather conditions on Mount Everest is the challenge of *Summit*. The climb has to be planned in stages so that camps get vital supplies and the ascent has to be made before storms make climbing impossible. Some high-quality graphics contribute to the realism of this simulation.

The suite of programs aims to familiarise children with map-reading techniques and geographical and meteorological terms, and encourage them to make informed decisions. The programs are mostly self-contained and need little introduction from the teacher – liberal use of help pages enables the pupils to use the simulations on their own while the teacher works with the rest of the class.

A series of Friday morning broadcasts next summer (June 7–28, 1985) will set the scene for these simulations, provide background information and vocabulary in the form of documentary and dramatised stories. But teachers and parents will be able to set children to work on the programs before then, for the 'Geosoftware: Exploring the Environment' set becomes available later this month.

It can be ordered from BBC Publications, School Orders Section, 144 Bermondsey Street, London SE1 3TH, quoting order no. ISBN 326522.



Teachers of modern languages, maths and technical subjects may be interested in a wordprocessing package that enables a variety of character sets to be used. *BBtype* gives, for example, French and German teachers a full set of accented characters, and Scandinavian, Spanish and a fair sprinkling of Greek characters are present. The full set of new characters is illustrated here, and *BBtype* is reviewed on page 181.

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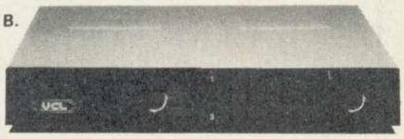
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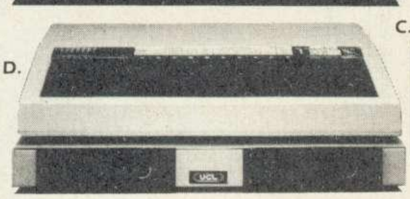


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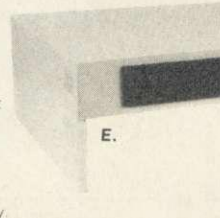
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Schools and the Act

THE implications of the new Data Protection Act may not be immediately evident to people in education. The act requires that anyone who processes data relating to people, unless specifically exempt, must register with the Data Protection Registrar.

School databases must be covered by the act and local authorities are already planning how they will cope. Records being produced now are going to become the subject of the law's requirements in 18 months' time when registration must be completed.

The broad features that affect education are:

- Data must not be kept any longer than necessary.
- People whose data is on record have the right to know they are on file, and to see the file. If it is incorrect they have the right to change it.
- The information must be accurate and kept up to date.
- Data intended for one purpose cannot be used for another.
- All files must be secure to prevent tampering.

Few databases used by schools are secure, as passwords or codes to open up editing facilities are rarely available on packages. The data itself is certainly not of an innocent nature as important decisions about a child's future are based on it.

Inaccuracies can be cumulative and catastrophic and it is for this reason that the Bill aims to make the information about individuals available to them. Schools and colleges will have to react by tightening up their procedures for storage and retrieval as well as deciding whether the information is relevant or even necessary.

It seems unlikely that individual schools will have to register since they are a part of the corporate local education authority which will register as a whole. Guidelines will soon be filtering down the system.


NEWS FEATURE
1984: the year of the micro modem
'Cobbled' data Bill could hamper the hobbyists
Third level for Econet
Classics for Atoms

Report in the May issue

Teachers in front line

YOU may have read in September's issue that one pearl from the thoughts of Acorn boss Chris Curry in his evidence to a House of Lords select committee was that 'Computer classes are a den of thieves'.

Computer magazines are full of stories on piracy and protection and we in education are at the forefront in the debate since we have the most contact with software and the greatest viewing audience. The excuse that software is poor and therefore should be pirated holds water only if we don't expect further programs to be produced, good or bad. If we expect good software to come then we must suffer the birth pangs of the less worthy material.



Curry: 'Classes are a den of thieves'

And teachers and pupils have a role to play. How often have you informed a producer what you thought of a program; how often have you been constructively critical? Remember – most suppliers are not teachers and can produce only what they think is needed. The exceptions are groups such as Longman and Heinemann who have long been in the education market and have schools and educationalists on their research teams. The difference in quality of software usually shows through – although not always!

Unfortunately, even the most reasonable arguments will not stop the unscrupulous in our midst and publishers are now taking steps (other than interminable software protection, thank goodness) to see that wrongdoers are brought to court. That however, is another story.

Ebury on the distaff side

'THERE is not a lot that people can do on a computer that is practical. The software does not exist . . . In reality the machine is only for playing games.' Thus says Ebury Software – a division of the National Magazine Company, which publishes *Good Housekeeping* and *Cosmopolitan*.

The company is obviously aiming to bridge the gap between computers and the female population. As a start, a set of programs to be issued in the spring will contain material that will enable them to learn with computers for applications in their jobs and for the education of their children.

Whether the software is going to fill the gap and convince women that the computer is a necessary adjunct to their own and their children's education remains to be seen. How many women are going to be converted by programs for gardening, knitting, cookery and home layout?

This seems to be the sort of role-stereotype reinforcement schools have been fighting against in their curricula for the past decade. And if, as Ebury's comments suggest, the computer is only a plaything, why are so many people buying machines for education, wordprocessing and even the labour-saving of home-accounts packages?

Think again Ebury.

Danger: VDUs

A REUTER report recently in many newspapers said that pregnant women using computer terminals in Denmark had suffered miscarriages. A figure of eight out of 10 was quoted and an investigation is underway at the Aahus Clinic for Occupational Medicine.

In schools, children are being exposed daily to radiation from monitors with little or nothing known about the long term effects. Watching a distant television is not quite the same, especially as monitors often are mounted directly above keyboards.

Chance to view

REGIONAL viewing centres give teachers access to software before they buy – an advantage when you consider that until recently most took pot-luck or relied on the wisdom of a reviewer.

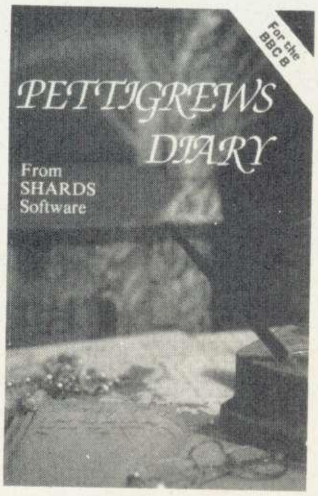
Consequently these centres are now approaching software producers with requests for material and give the schools a good selection, and the manufacturers a shop-window. Different authorities, however, are approaching the task from different angles.

Strathclyde Regional Council, for example, suggests that '. . .you will consider depositing copies of software. . .' whereas Humberside asks if '. . . you will be willing to either provide or offer a discount off the price of single items of software. . .'. MEP East Midlands offers '. . . the free publicity and marketing which MEP information provision and in-service training implies.'

Software houses are being inundated with such requests and it is to be hoped that suppliers are able to respond.

For little Acorns Mighty SHARDS Grow

SHARDS Software



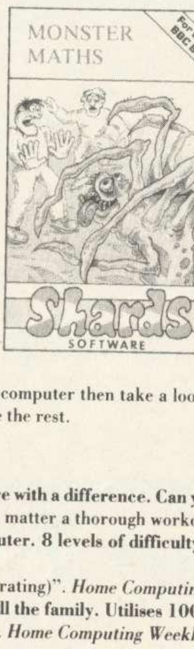
















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"I thoroughly enjoyed this game ... graphics are excellent (100% rating)". *Home Computing Weekly* **£6.95**

Mystery of the Java Star – **A graphic adventure for all the family. Utilises 100K of memory. Gripping stuff!**
"Exceptional value for money ... well done Shards (100% rating). *Home Computing Weekly* ***(BBC & Electron)*** **£7.95**

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Fun to Learn, the definitive educational series – written by teachers and used in schools nationwide. All programs are menu based and make superb use of graphics. 100% user friendly and error trapped.
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EDWORD HITS THE HEADLINES

Ron Gandolfo explains how he used a classroom newspaper project to introduce pupils to wordprocessing

TEACHERS are always looking for good ideas to help encourage children to write effectively. My opportunity came with an educational journey, on which I decided to base a classroom project. The project pre-



sented just the right occasion to introduce my pupils to wordprocessing, using the *Edword* system.

The use of the computer was only a small part of our project, however, which took the form of an integrated studies programme based on a journey to Weston-super-Mare. This included visits to Cheddar Gorge and Caves, Weston Museum, Bristol Zoo, *SS Great Britain*, Slimbridge Wildfowl Trust, Wookey Hole and Wells Cathedral.

On returning to school after our six-day trip the children set to work on an extensive programme of follow-up work, detailed as follows:

1. The children carried out research work on the visits that were made and could include any related topics of their choice. Thus the children did some ground work together as an introduction but thereafter could follow their own interests. This involved many visits to the school library, finding their way around reference books and other sources to find out information.
2. The research work was put into a project book. This book was made by the children and they were taught the skills of bookbinding.
3. A display of the children's work was mounted to decorate the school hall. This included models, pictures, letters, poetry, writing of different styles and general art work showing the use of different mediums.
4. An evening was set aside for the parents to see the children's work and to hear a verbal account of some of the events of the week.
5. The wordprocessor was used to produce a 'newspaper'. The purpose of this was to entertain and inform readers about the children's opinions as well as their thoughts and feelings about the school journey.

PRICES

'Edword' is contained in a 16k ROM which can be used on both models A and B of the BBC micro. It is marketed in several packs, the basic User Pack (£38.95) consisting of the ROM, user manual, self-instruction slip booklet and keyboard insert; for primary school applications the teacher will need the User Pack plus the Primary Guide, which costs £10 (cassette) or £12 (disc). The Starter Pack (£56.95 for cassette version, £59.95 for disc) is suitable for secondary schools. A Teacher Pack with cassette (£21.95) or disc (£24.95) includes a teaching guide, OHP and wall charts, information sheets on wordprocessing and instructions on setting up the printer.

Further details: Clwyd Technics, Unit 4, Antelope Industrial Estate, Clwyd CH7 5JH. Tel: (035 283) 751.

'Edword' was reviewed in the May issue of Acorn User, page 135 (but note updated prices as above).

Naturally after a school journey of the type described it stimulated the children's interest and they wished to communicate it. A newspaper could, of course, be produced without the use of a wordprocessor, but it had a number of advantages.

It gave our newspaper a professional look in its completed state. *Edword* offers wide and bold print which helped titles and subtitles to stand out. The children were able to indent their work and draw pictures around the text they had created, after it had been printed.

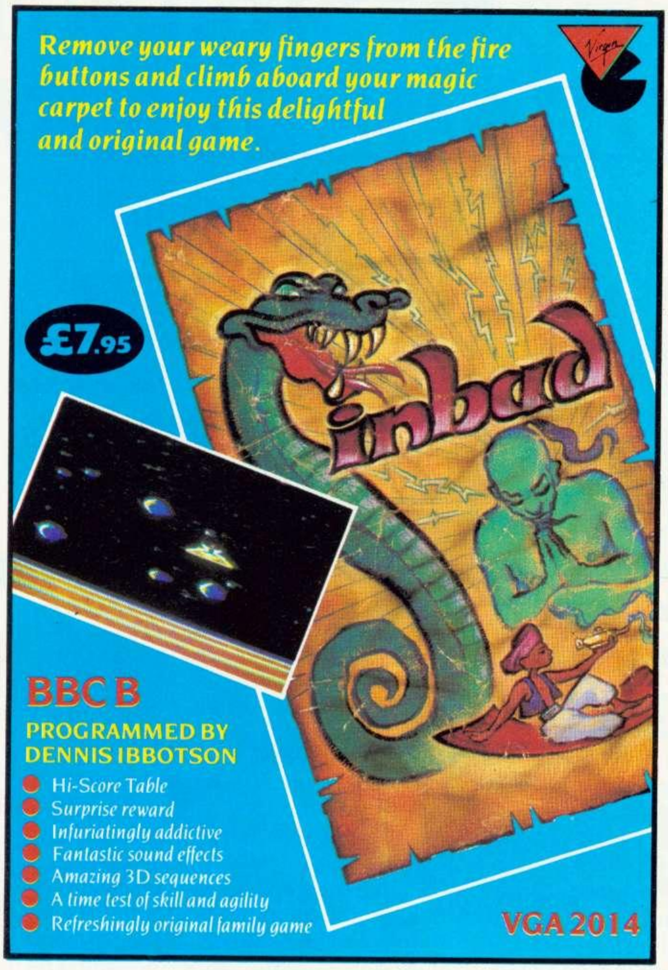
There was a natural progession from using a typewriter to operating a wordprocessor.

To produce a newspaper of the length and quality that we did would no doubt have needed the school secretary to have given up a lot of time to help us get a final draft typed and stencils cut. Using *Edword* meant that the children themselves were able to create, edit and print, thereby gaining



experience of all the different processes.

To say that *Edword* is a useful addition to the primary classroom would be an understatement. A wordprocessing system on a ROM chip for the BBC micro, *Edword* was designed by teachers for use by children, and at Courtwood Primary School, Croydon (where we use cassette tapes), it has



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One day I decided to go out hunting because we were running out of food. I lived with Lango my great companion. We lived in the outer edge of the cave. I picked up my spear and set off.I pulled my furs around me for it was cold. Then I spotted a Reindeer, I crept behind a tree and mounted my spear. I threw it, and BULLSEYE.I got her, and she fell to the floor with a thud. I sprang up and dragged her off to the cave. Lango was there waiting for me, he was infact fast asleep because he had been out in the forest all night. I rubbed two sticks together to light the fire and skinned the animal.
While the reindeer was cooking I went down to the river to wash the fur. It was a difficult and very messy job but after a while I got it finished. I filled the bowl I had with water and walked back to the cave.I was just time,because the food was cooked. I sprinkled herbs and spices on it and then woke up Lango. He yawned and sat up. He licked his lips and tore off a piece of meat and ate it up hungrily. Lango never said much but you can tell he understands. When he does speak its full of common sense.
After our meal we ran down to the river and bathed. Then we went back to the cave, and Lango went for his nightly walk. I set fire to the tip of a stick and hung it on the wall so that it lit up the cave. Then I started to make some clothes with the reindeer skin, a thin piece of wood and some thread.Then after that I painted a few animals on the wall of the cave with special chalks, which I really enjoyed. It was a picture story about my hunt for the reindeer. Then I snuggled down under some furs and fell asleep.

Story and photograph by
REBECCA FITZGERALD.

Left and above: two examples from the children's work produced for their newspaper. Edword enabled them to produce 'clean', corrected text in multiple copies, with indenting to allow them to 'drop in' their own pictures and bold and wide print to allow headings to stand out.

proved an extremely powerful tool. It is easy to introduce into the classroom and is an enhancement to most areas of the curriculum.

Faced with two thick manuals, I thought learning *Edword* would demand much detailed reading and practice. Far from it: although I gave myself a weekend to work through the manuals, the children were able to start using *Edword* knowing very few commands. Once taught how to get into *Edword*, where the cursor keys are and the position of the delete button, pupils can create something worthwhile, especially if they are familiar with the typewriter.

Having mastered the basic skills, one can progress to learn the detail as needed. I have used *Edword* with 11-year-olds, but I'm sure it could be introduced to quite young children with just a little keyboard experience.

By the time children have written some experimental documents they are ready to take on the skills of editing and restructuring text, especially when they show eagerness to improve their document. The children soon start asking questions such as 'How do I swap a word for a different one?' or 'What does this justify key do?' or even 'Is there a quicker way of doing this?' They quickly discover that with *Edword* you can be almost certain there is a quick method and they want to know more about the word processing system itself. In this way they are introduced to a few commands at a time.

Every child was involved in writing articles for the newspaper. The children worked in twos or threes discussing their thoughts and ideas, then they took it in turns to type their ideas on to the wordprocessor. Through discussion and some help from me they were able to edit their own work. One child was made general editor, although all were taught basic *Edword* editing skills.

Different styles of writing were included – formal and informal, fiction and fact, light-hearted and serious. The wordprocessor enabled us to consider what was presented in a real newspaper and create our own version in our own style. We included sensational headlines, general news, sports items, leisure activities, a fun page, adventure stories, a reviews and opinion page, a history section, adverts, ornithologist's section, exclusive interviews and a



page for younger readers.

When the children had completed editing their work, four copies were printed off. One copy was used for display, one for the child's project book, one for the newspaper duplication and the fourth for the child to take home. By traditional methods it is a lot to ask a child to write an extra copy for display purposes, but copying it out four times would have been unthinkable!

Producing multiple copies is very easy with *Edword* as there's a simple procedure of pressing the print key f8 and answering the question 'Is your printer ready (y/n)?'. This process is rapid. It prints a page of 66 lines in just over a minute.

The printer caused great interest at first, with the whole class crowding around it, but within a short time the children accepted it like any other piece of electrical equipment in the classroom and continued doing their work and awaited their turn. At first the noise of the printer, an Epson RX80, was quite off-putting, but interestingly it put me off more than the class – children adapt amazingly to new things in the classroom.

Edword can be used with a wide range of printers. A printer file needs to be made to suit the printer in use, and this can be achieved with a package called 'Printer File Generator', available from the same source as *Edword* (see prices panel).

Once we had all the articles for the newspaper printed off it was a simple matter for me to make use of a photocopying machine at the local teachers' centre. We decided to produce 100 copies. This was the only activity the children did not take part in. When the originals had been photocopied the children got on with sorting and compiling the pages and stapling them together. The front cover had been photocopied on yellow paper to make it look attractive.

Educational benefits of wordprocessing

Like most wordprocessing systems *Edword* allows children to refine their own work. It has many easy-to-use features to this end. Refining can be improved with constructive criticism from the teacher and/or fellow pupils. Children need to be encouraged to read over their work with a critical eye and have the opportunity to discuss it with their friends – they learn an enormous amount from each other. So often children are expected to work in isolation and the results are disappointing. Pupils who are given the opportunity to discuss their work with each other far more often produce something of a higher standard. I have always encouraged them to work in pairs on the wordprocessor when they are editing and restructuring a document. We all learn by our mistakes and it is excellent practice for the children



to talk about what they are doing and try something out.

To write for a real purpose and for a wide audience is most important to children. So often work is completed in isolation in an exercise book that will be read only by the teacher and then forgotten. With the newspaper the children were able to write articles and documents knowing that what they were producing would be printed and distributed, and therefore read by their parents, other adults and their friends. The children soon recognised the need to produce something worthwhile.

The presentation of a child's work was important to the child. The 'hard copy' from the printer gave every child the chance to have something to be proud of. Children whose presentation and handwriting are poor might have been inhibited in producing enthusiastic contributions, but with a wordprocessor the poorest of calligraphers are on a par with the best. All feelings of failure in this respect were now obliterated. In turn teachers must display work carefully and pleasingly.

The computer seems to have exceptional powers of motivation for children, and this holds true for the wordprocessor.

Many of the skills that the wordprocessor helps us to develop in children have been ignored in the past. Traditionally teachers have not expected children to correct every mistake in a piece of writing, but with a wordprocessor refining and correction can be introduced sooner to children, who are often amused by their most glaring mistakes. It is only fair that they get the opportunity to correct them. With a wordprocessor, teachers also find they can correct more mistakes in a child's work, for it is so easy for the child to recall a document that has been saved, and then refine it. Perhaps this is the crux of the matter, as the child no longer has to waste time rewriting the complete piece of work.

High standards appropriate to a child's ability can be set. Children can benefit by learning to edit, restructure, improve and expand text, skills otherwise not usually practised.

The children soon became proficient two-finger touch typists and it was not necessary to give typing lessons. If they had been first-class typists their train of thought would not have kept pace and more errors would have occurred. Speed on the keyboard was related to speed of thought.

It was quite noticeable from the beginning that because the wordprocessor gave the children a clear screen with their work neatly printed they were going to take more care with punctuation and spelling. I frequently found a dictionary on the computer table and even a thesaurus. This was most encouraging and even more so to hear children talking about the best word to use or the correct use of punctuation.

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Problems with Edword

While creating our newspaper we stumbled across a few problems with *Edword*. Most importantly, children irretrievably lost entire documents by accidentally pressing the Break key after spending considerable time at the keyboard. This is easily done because the f9 command key is next to the Break key.

The command key is frequently used and it would be a great advantage to have the Break key disabled.

A facility that we would have found most useful would be to add a document, previously saved on tape, to a part document already on the screen. For instance, if a group of children were creating a page of work for a magazine but two documents had been saved on separate tapes, then the only way of making them one document would be to type one into the other. The ability to merge two documents would have been advantageous.

It was essential that the children were encouraged to label their cassette tapes with care, otherwise problems occurred. The system that worked best was to give each group a cassette tape of their own which they marked with the following information: child's and/or children's names; a phrase to describe the topic; and the document name in inverted commas.

Unfortunately you are given only one chance to save a document. If you use a faulty cassette tape the document is lost. So another useful feature when saving documents would be the opportunity to save a second copy as a safety precaution.



To save a document all you do is press Escape and answer the question 'Return to main menu y/n?'. If you answer yes the next instruction is 'Record and Return'. This is misleading and my pupils made the mistake of not pressing play as well. The instruction 'Press Play and Record then Return' would be better.

Using the cassette tape system is slow and in fact loading in the documents is the most time-consuming part. Fortunately *Edword* offers the use of a disc file system, though I have yet to use it.

Conclusion

Having used *Edword* with children I believe it has a lot to offer education and the advantages far outweigh the disadvantages (see *Good Features* box). A particularly reluctant writer asked if he could come to school at 8.30am to use *Edword*. No lunch hour passed without a request to use it. In the words of the children: '*Edword* is a very interesting and useful program' and 'It will always be a popular work piece'. It is a superb and powerful tool to enhance the work going on in any primary classroom.

The author is deputy head of Courtwood Primary School, Croydon

GOOD FEATURES OF EDWORD

Easy to use – The keyboard is used in a similar way to a typewriter. The keys are the child's pen and the screen his paper. Single-key depressions are most frequently used. Special key depressions such as Shift and Control characters are not needed. Text can be easily corrected, inserted, deleted and edited.

Mnemonic commands *Edword* makes excellent use of the BBC micro's function keys. When children are being taught editing skills, and are introduced to the function keys they are easy to use and to remember. To go to the top of the document, for example, you press Command and T for top.

Display width – There is a choice of 40 or 80-column text with the BBC B. The 40-column screen is useful for younger children, as the text is large and clear. The 80-column measure closely matches normal textbook width when the document is printed.

Screen-based – It is useful to know that what you see on the screen will appear as hard copy. Not all wordprocessing systems have this feature.

User-friendly – A useful 'error help' system has been incorporated. This involves a beep sound if an error occurs. If f4 is pressed a simple error message appears at the bottom of the screen. This message disappears on the next keystroke.

Screen information – The top of the screen gives you continuous information, including document name, mode, page, line and column that the cursor has reached, left and right margins, tabs and indents. Other indicators include print, underscore and overtyping. The bottom of the screen gives error help messages. 'Safety' prompts are sometimes given – for example confirmation before losing a document from the screen.

Wordwrap – An excellent feature of *Edword* is the automatic wordwrap. This means you can type in a document at high speed without worrying about the ends of lines. Words that will not fit on the end of a line are automatically taken to the next line. Thus no unsightly lines with part-words occur.

Justifying text – The neatness and presentation of a document is naturally important. To achieve this *Edword* supplies four features. Text can easily be 'justified' so that text aligns down the right hand margin as well as the left. This gives a professional look to the children's work as this is how it appears in their text books as well as newspapers. *Edword* also offers the facilities of underscoring (underlining) and wide and bold text.

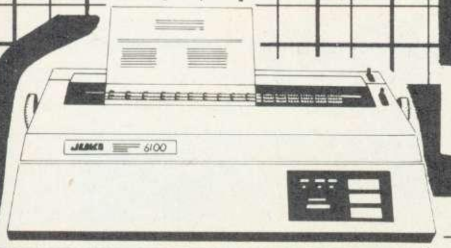
Indenting – This is a particularly useful feature especially if children produce a picture to go with their writing. Indenting enables the user to leave a space for a picture to be inserted into a piece of writing. The length of the lines can be altered and script can be set around the perimeter of the picture.

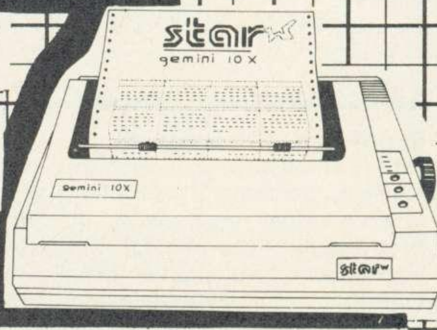
Format – Neat pages of text can be created by setting the format mode. Top and bottom margins can be set as well as left and right ones. Within the format mode up to six tabs can be set, the page length can be altered and line spacing can be single or double.

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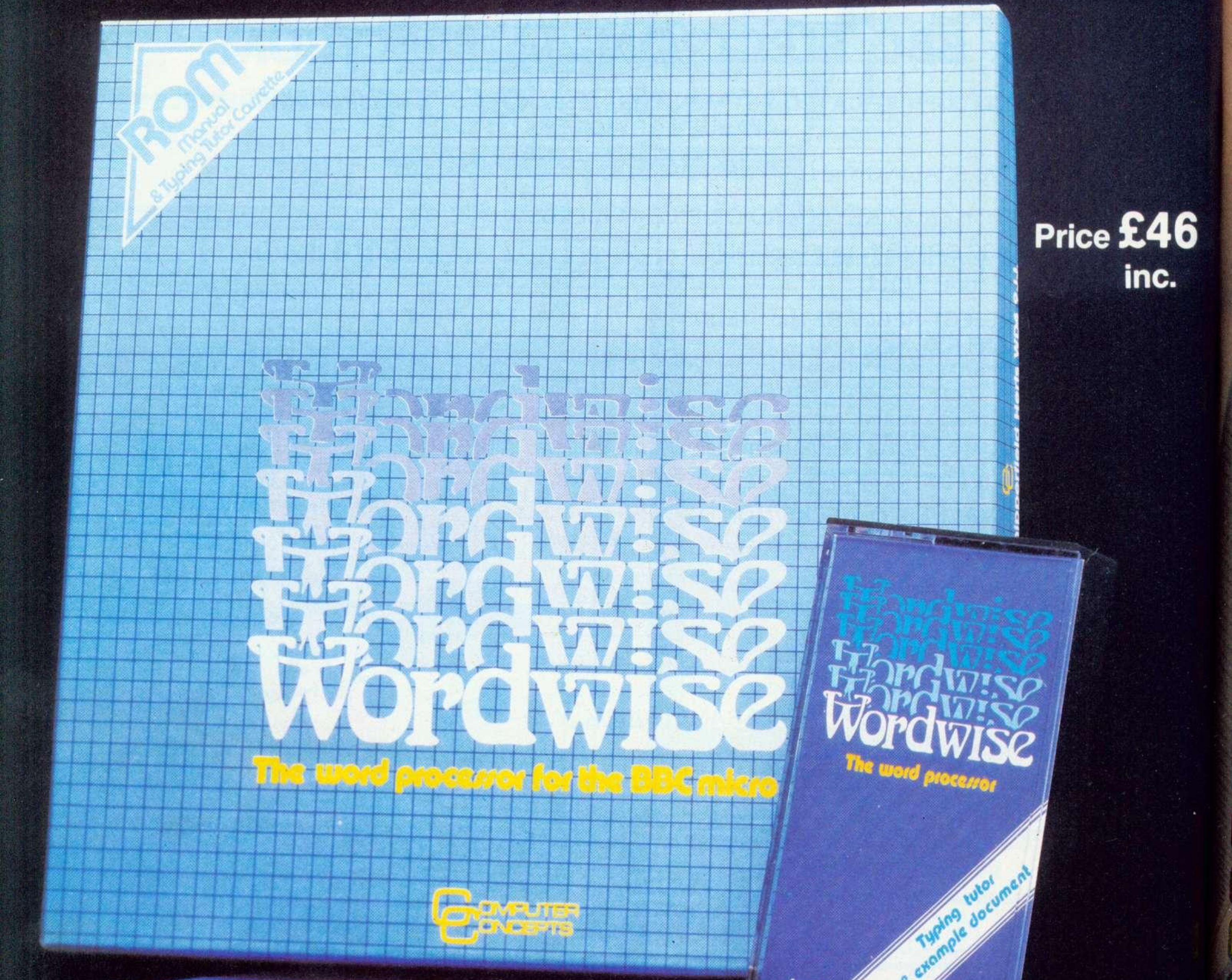
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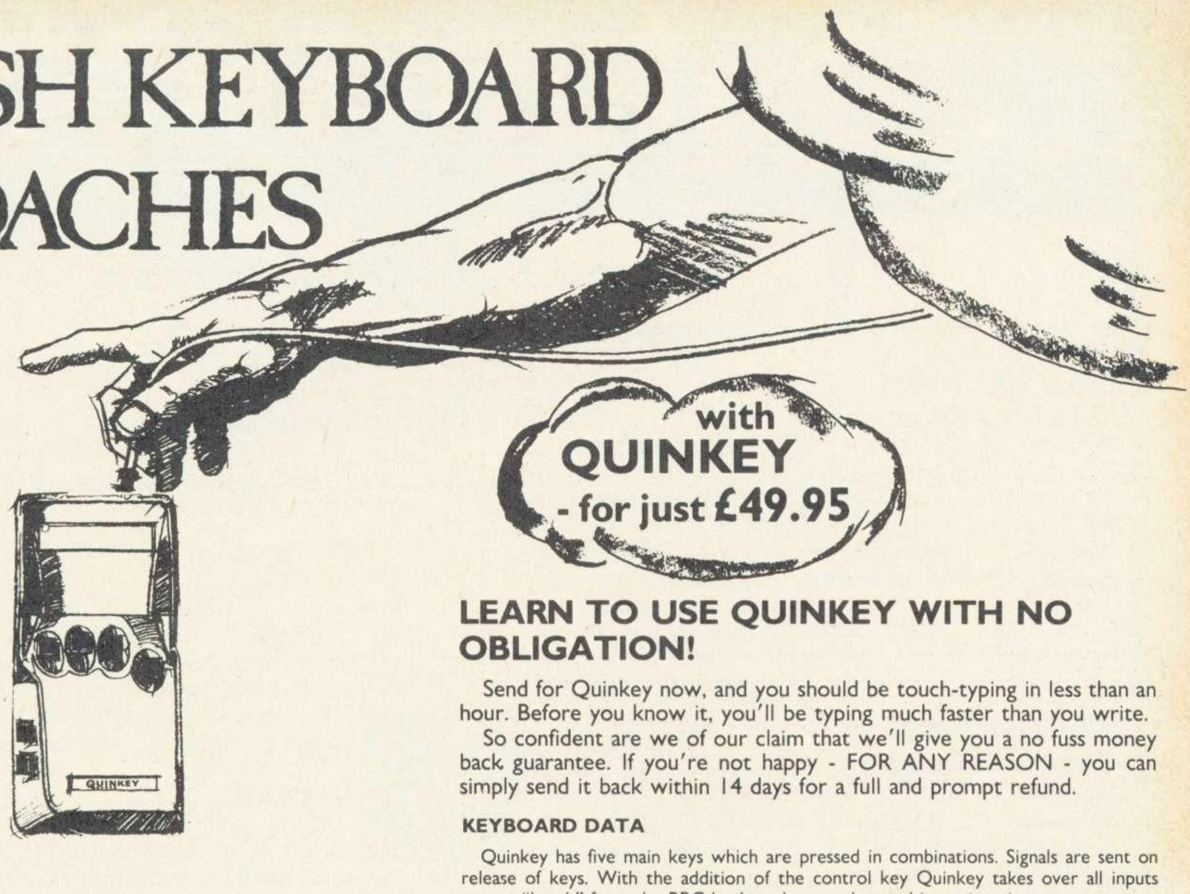
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THE REMEDY FOR "MICRO FATIGUE" - THE ONLY ALTERNATIVE FOR SERIOUS BBC USERS.

Having to face keying a lengthy piece of data is pretty daunting, but that's nothing compared to how you feel when you're only about a quarter the way in.

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- Quinkey is a keyboard which you simply plug into the analogue port of your BBC computer.
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- With Quinkey there's no need to lose your place either - your other hand is free to follow data.
- Whether your work is with words or programs, Quinkey is a must. It can even double as a fast and accurate keypad for mass numeric data.

YOU'LL BE AMAZED AT WHAT YOU GET FOR £49.95

Quinkey is sold as a complete package ready to be used right away with your computer. Each pack for the BBC contains:

- Quinkey keyboard
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- Easy to follow self-teach guide
- "PROG" software (a utility program which interprets Quinkey signals to the BBC and gives you a comprehensive alternative/additional keyboard - all inputs except "Break". It merges easily with your application programs)
  "WP" enables you to fully use software such as "Wordwise", "View" and "Edword" for fast and accurate word-processing.

LEARN TO USE QUINKEY WITH NO OBLIGATION!

Send for Quinkey now, and you should be touch-typing in less than an hour. Before you know it, you'll be typing much faster than you write.

So confident are we of our claim that we'll give you a no fuss money back guarantee. If you're not happy - FOR ANY REASON - you can simply send it back within 14 days for a full and prompt refund.

KEYBOARD DATA

Quinkey has five main keys which are pressed in combinations. Signals are sent on release of keys. With the addition of the control key Quinkey takes over all inputs except "break" from the BBC keyboard or can be used in conjunction.

Quinkey casing is made from sturdy FR ABS. Professional quality keys and gold cross point microswitches will give heavy-duty performance.

SOFTWARE DATA

When invoked using CHAIN "WP" or CHAIN "PROG", loads at the current PAGE value and moves PAGE up by 768 bytes. No zero-page locations required. Interrupt service vector IRQ2V, correctly chained. PROG may be incorporated into users' programs without difficulty.

INTERFACE DATA

Quinkey's interface to the analogue port of the BBC is a four-channel connector which allows up to four Quinkeys to be used simultaneously with one micro. (For further information about the Educational Pack of four Quinkeys and schools software, tick the appropriate box in coupon)

TESTED COMPATIBILITY

BBC model "B" OS 1.2 BASIC I or BASIC II (unless using INKEY with negative argument), DFS 0.90. View A1.4, Wordwise 1·17, Edword.

FOR COMPREHENSIVE REVIEW OF QUINKEY SEE ACORN USER, SEPT '84

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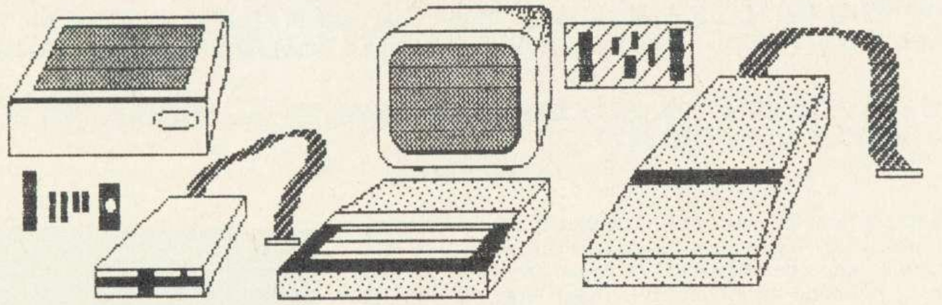
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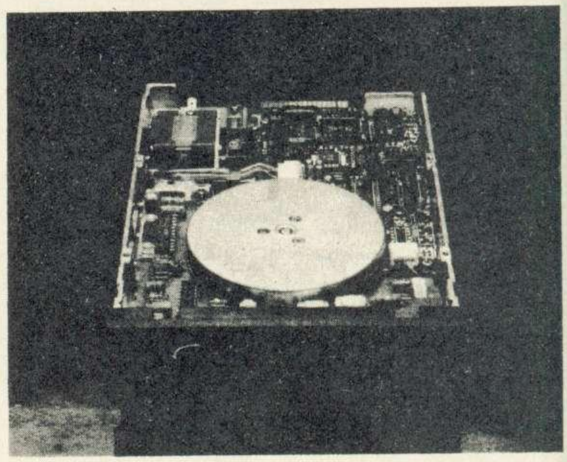
SOLIDISK HAS SOMETHING TO OFFER.

— FOR THOSE OF YOU WHO DO HAVE ALREADY, A DUAL FDC DISK FILING SYSTEM (DFDC, using the old 8271 and adding the new WD1770 FDC), ADDS DOUBLE DENSITY AND KEEPS TOTAL COMPATIBILITY (See opposite page).

— FOR THOSE WHO HAVEN'T, A DUAL DENSITY DISK FILING SYSTEM (using the new WD 1770) WILL PROVE MUCH FASTER AND CHEAPER THAN THE 8271.

THE DISK DRIVE:

The disk drive (see pictures) comes from the new series VLSI ultra quiet, auto spin-up, 5.25" half height, solenoid head load, 40/80 track, single and double density MITSUBISHI M4853. It is fast, quiet and consumes far less power than any previous models. 2 new 64 pin surface mounted microcontrollers (from Motorola and Mitsubishi), largely reduce the area occupied by the drive electronics (see pictures), leaving so much more room for the diskette, with very low noise level and reduced friction of the media and the jacket.



SOLIDISK DUAL DENSITY DISK FILING SYSTEM.

Basic characteristics include very high operating speed, Acorn compatibility, automatic 40/80 track switching, auto-density, resident disk formatter and 100% compatibility with Solidisk Sideways RAM.
It is also the simplest ever Disk Upgrade for the BBC computer: with only 4 components: 1 ROM, 2 buffers and the FDC. (See picture 3).

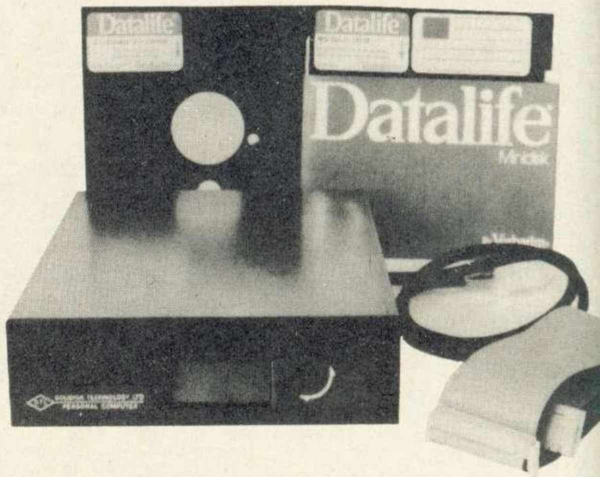
Solidisk software engineers have built in to the 8192 bytes of the 1.40 ROM more facilities than any other DDFS manufacturer has managed before.
The result is a substantial cost reduction, which is passed on to you.
Solidisk engineers won't stop there.
But let's first answer some more immediate questions.

1 — SINGLE OR DOUBLE DENSITY?

You get 60% more storage in double density mode than in single density mode at no extra cost.

In single density — the usual Acorn disk format — you get 10 sectors or 2.5 k bytes of storage per track. That is what the Acorn DFS and many others can do.
In other words, you get 100k with a 40 track single sided disk drive (such as the TEAC 55A), 400k with a double sided 80 tracks disk drive (such as the one in this offer).
In double density, you get 16 sectors or 4k bytes per tracks, an increase of 60%.
With the same TEAC 55A disk drive, you get 160k instead of 100k or with the disk drive in this offer, you get 640k bytes instead of 400k.

The majority of software tested also runs FASTER in double density mode than in single density mode, especially Wordwise, View, Masterfile and Scribe and 95% + of games are also compatible with double density.



2 — INSTALLATION:

As the STL DFS consists of only 4 ICs, to be plugged into existing sockets on the BBC computer board, installation is quite simple and should not take more than a few minutes even if you are a novice. Simply instal the 4 ICs into their sockets and connect the disk drive (see picture 4).

3 — BASIC DISK SYSTEM COMMANDS AND UTILITIES:

— *ACCESS <afsp> (optional L)
— *BACKUP Ωsource drive> <dest. drive>
— *COMPACT (optional <drive>)
— *COPY <source drive> <dest. drive> <afsp>
— *DELETE <fsp>
— *DIR (<dir>)
— *DRIVE (optional <drive>)
— *ENABLE
— *F40 (optional <drive>)
— *F80 (optional <drive>)
— *INFO <afsp>
— *LIB (optional <dir>)
— *LOAD <fsp> (optional <load address>)
— *RENAME <old name> <new name>
— *SAVE <fsp> <start> <end> <exec>
— *TITLE <title>
— *VERIFY (<optional <drive>)
— *WIPE <afsp>
— *BUILD <fsp>
— *DISC
— *DUMP <fsp>
— *LIST <fsp>
— *TYPE <fsp>
— *DDFS

THE SPECIAL PACKAGE DEAL:

A COMPLETE 640K DISK OUTFIT AT ONLY £209.95 INCLUSIVE:
— ONE 80 TRACK DOUBLE SIDED DISK DRIVE.
— ONE DOUBLE DENSITY DISK INTERFACE.
— ALL LEADS AND MANUAL.
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— DATABASE.
— STOCK CONTROL.
— MACRO BASIC.
— FULL ONE YEAR NO QUIBBLE WARRANTY.

Optional extra:
— DFDC instead of DDFS: £10.00.

Other OS commands include LOAD, SAVE, BPUT, BGET, OSFILE, BLOCK GET, BLOCK PUT, OSARGS, OSFIND, PTR, OSWORD 7F, 7D, 7E etc.

Care is taken in the disk directory presentation, showing the disk size and other useful information. Whenever a diskette is being spun, its number of tracks and density are identified. This information helps the DFS to skip alternate tracks if a 40 track disk is in use in an 80 track drive and also switch the FDC to single or double density.
The net result is exceptional response and user-friendliness.
Outstanding speed too.
As shown in the benchmark test on the opposite page.

CUT THE COST OF RUNNING YOUR MACHINE

Solidisk DDFS comes with free bundled software: (see picture 5).

— Solidisk Database — a fast, efficient and flexible disk based random access database. Ideal for prescription records, club membership etc.
— Solidisk wordprocessor.
— Solicalc electronic spreadsheet.
— Stock Control — very useful for small commerce. Features include menu driven, easy to follow operating instructions, stock items can be grouped by categories, by suppliers, by frequency of movements etc. Stock valuation report (inventory), sale price list, reorder forms can be printed automatically as requested.
— Silexicon — the most successful spelling checker with English, French and German dictionary. Self dictionary generating capability.
— Macro Basic — a BASIC program generator capable of using bits of old programs to create new programs. Simply ingenious!
— Benchmark for disk drive and disk utilities.

4 — OUTSTANDING PERFORMANCE:

The table below shows the benchmark timing for STL DDFS 1.4. The benchmark consists of disk operations such as save and load a 16k program, open and close files, BPUT, BGET strings and numbers, format and verify a disk etc., and is available upon request, otherwise listed in Solidisk DDFS User Manual.
The benchmark tests B1 to B9 are the same as used by many reviewers. The time is expressed in seconds and parts of 100th of a second. The disk drives are twin 40/80 track double sided MITSUBISHI M4853, the diskettes are Verbatim Datalife MD 557 series, 96 TPI, double density, double sided, pre-verified to ensure that the media is free of all error and mechanical defects and containing solely the benchmark program. The test is loaded into memory, the drive motors are allowed to stop completely 2 seconds between tests, 10 timing samples are taken and the mean time is calculated automatically.
For example:

```
100 DEFFNb1:REM Save a 16k program.
110 T% ÷ TIME
120 *SAVE A 8000 +4000
130 ÷ TIME — T%
```

Full listings are included in the User Manual.
This FN is called 10 times with 3 sec. interval, the mean result is printed as 'B1'.

BENCHMARK DESCRIPTION	S/D TIME	D/D TIME	
B1 Save 16k	2.62	1.43	
B2 Load 16k	2.45	1.23	
B3 Openin and close 100 times	20.70	20.16	*See note 1
B4 Openout and print 1000 numbers (255)	5.84	4.66	
B5 Openin and input 1000 numbers (255)	4.72	4.14	
B6 Openout and print 100 80 bytes strings	6.18	4.91	
B7 Openin and input 100 80 bytes strings	4.90	4.31	
B8 BPUT 100 bytes (255)	3.01	2.06	
B9 BGET 1000 bytes (255)	1.88	1.52	

OPERATIONS	S/D TIME	D/D TIME
FORMAT 40 TRACKS:	17.74	17.74
FORMAT 80 TRACKS:	33.22	33.22
VERIFY 40 TRACKS:	9.30	9.30
VERIFY 80 TRACKS:	17.84	17.84
BACKUP 01 80 TRACKS:	37.69	37.69
BACKUP 02 80 TRACKS:	39.46	39.46
COMPACT 100K-10 FILES	22.42	18.82

Note 1: Whenever a file is to be opened, STL DDFS automatically refreshes the disk directory, thus preventing erroneous disk change. Many other DFS's do not take the same care, although yielding a much shorter time, and this could accidentally stop the program.

With Wordwise:
Load 2000 words (17811 bytes) 16.80 sec. (41.40 sec. with AC.
With Scribe:
Count 2000 words (17811 bytes) 4.20 sec. (9.80 sec. with AC .90 DFS)
With Beebug's Masterfile:
Sort records 1 to 20 in PEOPLE sample database, the database is presorted on field 2 then the program is asked to sort on field 1, the time is then taken: 56.23 sec. (127.86 sec. with AC.90 DFS). These timings are improved even further in double density mode.

The figures speak for themselves.

STL DDFS dramatically increases the operating speed of your software, including wordprocessors like Wordwise, View, Scribe, databases like Masterfile, Starbase etc.

Solidisk engineers won't stop there.

ONE ROM TO RULE THEM ALL

Already a super mini floppy (2.4 MB) and controller for under £400, a 10MB integrated Winchester hard disk for under £600 AND AN EVEN MORE POWERFUL 16K ROM (2.0 UPGRADE) with outlined specifications below are planned for Christmas.

— Unlimited number of entries into the disk directory.
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— Disk sector editor, disk search and replace, tape to disk, disk to memory below PAGE, disk duplication.
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— Quadruple FDC drivers (8271, 8272, WD 1770, WD 2793).
— RAM Disk facilities for Solidisk Sideways RAM.

6 — SOLIDISK DFDC:

THE ONLY SYSTEM TO ADD DOUBLE DENSITY AND KEEP COMPATIBILITY.
If your BBC is already fitted with Acorn Single Density DFS, you can ADD double density to your system and KEEP the existing DFS with Solidisk DUAL FDC Filing System (DFDC).
Solidisk DFDC system overcomes the problems caused by around 5% of the games 'specially those produced by Acornsoft newest releases such as Elite). These programs (directly) controls the 8271 thus requiring its presence.
Solidisk DFDC ROM controls BOTH FDC at a flick of a switch, you can choose the new FDC for speed or the old 8271 for Acornsoft game disks.

7 — PRICES (including P and P and VAT)

STL DDFS (disk chip upgrade for BBC B)	£39.95
STL DFDC for those who have Acorn DFS	£49.95
640k DISK OUTFIT (complete package)	£209.95
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To order, you can use the coupon. Access and Barclaycard holders can ring direct:

HOW TO ORDER?

You can order any item using the coupon. Prices are inclusive of VAT, post and packing. Access and Barclay card holders can place their order by phone.
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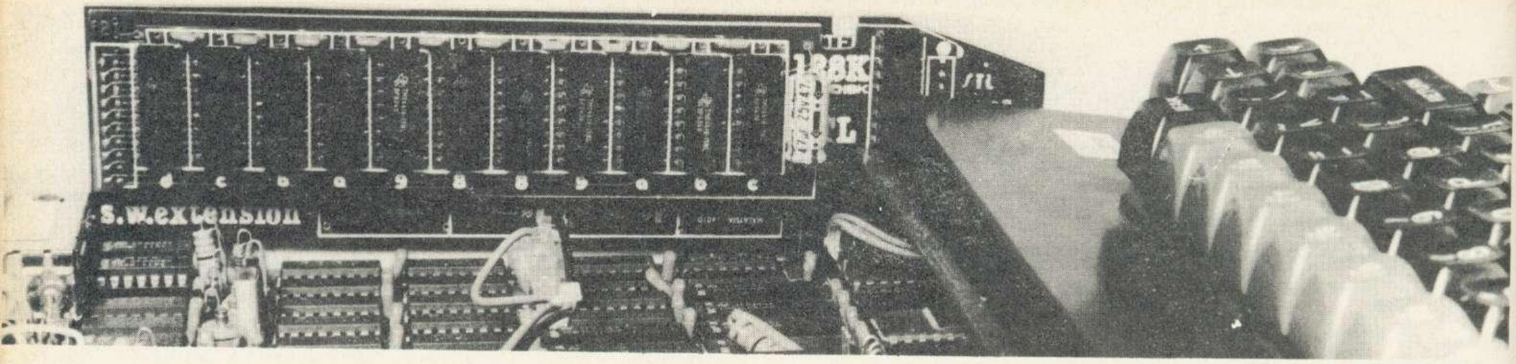
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Total:

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ESSEX SS2 6JQ

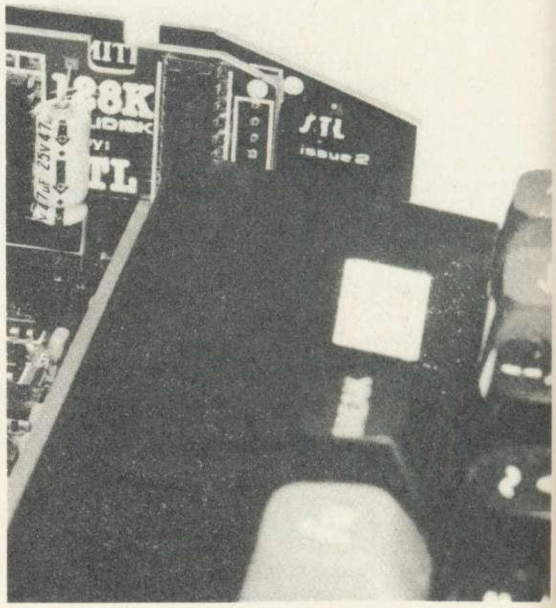
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SOLIDISK SIDEWAYS RAM: 25,000 UNITS SOLD

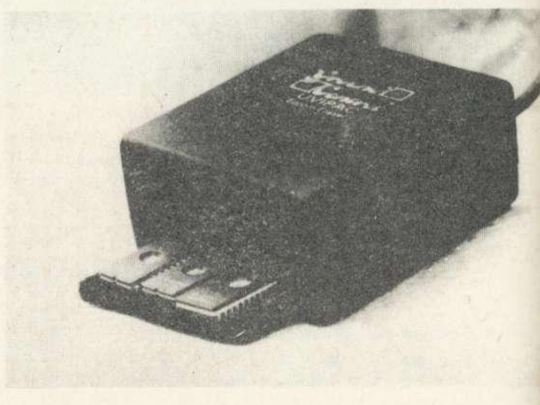


"Exciting" (ACORN USER JAN 84), *"Power to your Beeb"* (PCN 61, MAY 84), *"Break the RAM Barrier"* (A&B)

HAS YOUR BBC COMPUTER GOT ITS SIDEWAYS RAM BOARD YET?



UVIPAC EPROM ERASER



TEAC DISC DRIVES FD55 Series



Not surprisingly many BBC computers have got their sideways RAM boards. Solidisk Sideways RAM can be completely integrated into the BBC computer system: with 6502 and Z80 second processors, Torch disk pack, teletext, Econet and Solidisk 8— sideways ROM expansion board.
Adding Sideways RAM to the BBC computer is simple. And it will multiply the machine's power.
Here is how.

1— HOW DOES IT WORK?
Occupying the same place as sideways ROMs (such as BASIC, DFS etc) it is treated like other sideways ROMs and therefore can replace them.
Sideways RAM can run any language, and filing system, wordprocessors, databases etc.

2 — WHAT SORT OF SOFTWARE DOES IT RUN?
Better than sideways ROM, sideways RAM can be written into. This property makes it not only possible to run the same programs as their ROM counterparts but sideways RAM can be used as Virtual Memory, RAM disc, printer buffer, Basic program store, 65-C-02 assembler, zero RAM, take DFS etc, etc . . .

3 — WHAT OTHER SERVICES DO YOU GET WITH ALL SIDEWAYS RAMS?
Solidisk sideways RAM comes with lots and lots of free software (see list on opposite page). As a sideways RAM user, you will be able to get updated disks*, free local expert advice and free bi-monthly newsletters to keep you informed. Solidisk spend more than 1,000 man hours every month to produce free software for all sideways RAM users. More and more free software will be available every month.

4 — WHO USES SIDEWAYS RAM?
Solidisk sideways RAM is widely used in schools for ECONET, by programmers to develop new software, in small business systems for wordprocessing and database** and now at home, even for games. New applications are being found every day, such as moving screen memory to Sideways RAM (essential for increasing memory for VIEW and VIEWSHEET), Colour Imaging System, Teletext page logger and generator, computer typesetting etc.
Sideways RAM is such a versatile and flexible instrument that it will renew your interest continually.

5 — WHICH SIDEWAYS RAM DO YOU NEED?
Solidisk sideways RAM is available in multiples of 16k, each replacing a sideways ROM. Units are in 16k, 32k, 128k and 256k.

The first step is to evaluate your needs.

Then consult the chart opposite.

You can buy a small unit to start with, and exchange it later for a larger one. Extra costs involved with upgrading are minimal. The SWR16, 16k sideways RAM is adequate for most simple tasks (running common programs or for Econet slave stations), including fast disk copying with a single disk drive.

For wordprocessor: using VIEW or WORDWISE, a SWR32 will do. Large documents (20 page plus) will require something like SCRIBE and the 128k or 256k Solidisk**.

For database, unless very high speed is required, a SWR32 will suffice for most popular databases such as Beebase, Fileplus, Starbase, Datagem. Otherwise use the 128k or 256k Solidisk**.

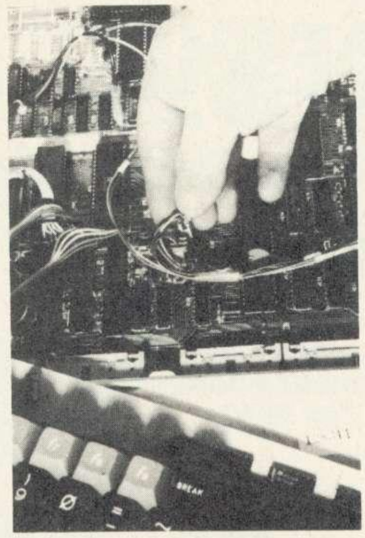
Remember — the more memory you instal inside the BBC computer, the more power you will get out of the machine.

All sideways RAM units come complete with 60+ page Sideways RAM User Manual, 1 utility diskette and 1 year warranty.

****Solidisk recommends SCRIBE and STARBASE because they exploit perfectly the inherent speed of RAM disc.** Quite often, some users try to solve a software problem (such as increasing the size of Wordwise) by a hardware solution (buying the 128k Solidisk). The better way is to buy Merlin's Scribe (or wait until we offer you one similar for free) and then increase its speed with the Solidisk. The situation regarding databases is much simpler as Solidisk works well with most of them (from 6 times speed increase with Beebug's Masterfile to 2 times with Starbase).

6 — SENDING FOR FREE SOFTWARE:
Our free software is divided into volumes and is available in single density, either 40 or 80 track 5.25" diskettes. 40 track diskettes contain only 1 volume, 80 track diskettes contain 2 consecutive volumes, (1+2, 3+4, 5+6, etc.)
All sideways RAM is supplied with 1 diskette, containing either VOL. 1 (40 tracks) or VOL. 1+2 (80 tracks) as requested. Extra volumes are charged foe media and postage cost.

The following volumes are available at the present time:
— **VOL. 1:** General Utilities: Menu, STLDISC, STLOEOO, STLRFS, Printer Buffer, STLRFS, Quickly, Fastbackup, Keyboard, Word64, help!.
— **VOL. 2:** English Spelling Checker: Suilexicon and English dictionary (15000 words).
— **VOL. 3:** BASIC program generator: Macro Basic. Never Bad Mode again: Virtual Memory.
— **VOL. 4:** Database: Solidisk Datafile.
— **VOL. 5:** Foreign Language Dictionary Generator: Silexigen, Silexicon source code for programmers.
— **VOL. 6:** French spelling checker (15,000 words).
— **VOL. 7:** German spelling checker (13,000 words).
— **VOL. 8:** Machine code tools: Solimon, the finest machine code monitor with Disassembler, debugger, single step etc. for both 6502 and 65-C-02 (for second processor 65 C 02 assembler (for second processor), UVIPROM control software, SPRITES and SPRITE generator (providing 60 sprites per 16k sideways RAM).
— **VOL. 9:** to be released in October: Solidisk Toolkit, Rubber band, and Z80 drive C (RAM disc facilities for Acorn Z80 second processor).
— **VOL. 10 to 19:** Source code for use with the Technical Manual.


Connect the control wires

7 — TECHNICAL MANUAL:
THE TECHNICAL MANUAL contains estensive program listings and notes by their authors. It also covers the MACRO language programming (part of Macro Basic), MOS conventions for sideways software. Solidisk conventions for sideways RAM software, STL DFS entry points, the 65C02 programming facilities and schematic diagram.
The Technical Manual package consists of the Technical Manual and 3— 80 track diskettes containing VOL. 10 to 15 and costs £10.00.

8— LOCAL EXPERT HELP:
A list of Solidisk experts is printed in the Sideways RAM User Manual. For the cost of a local call, they can certainly help you with installation of software advice.
Potential experts are warmly invited to contact us.

UVIPROM EPROM PROGRAMMER AND UVIPAC EPROM ERASER

The UVIPROM EProm programmer, which plugs into the user port, allows the user to program 2764 and 27128 EPROMs, either from disc or master ROM. The unit is self-contained, complete with built-in Vpp generator and system software. Commands available are:—
*TEST — blank test for new (or erased) EPROMs.
*BLOW<aspf> — programs EPROMs from disc.
*COMP<aspf> — compares programmed EPROMs with source on disc.
*VIEW — displays hex and ASCII dump.
*READ<aspf> — reads contents of EPROM to disc.

UVIPAC-EPROM ERASER:
Mains powered EPROM eraser, can erase up to 3 EPROMS of any size in only 15 minutes. Housed in a custom moulded plastic case, with optical fibre indicator.

SOLIDISK ANNOUNCE THE MOST EXCLUSIVE SUPPORT FOR THE 65-C-02!

Have you heard about the 65-C-02?
This is the CPU that Acorn has retained for their second processor. The 65C02 has an extended instruction set, with 43 brand new OPCODEs for you to play with. Things as PHY, PLY, STA (&A6), STZ, BRA, TRB etc can save 20ı of memory and increase speed by 20-25%.
SOLIDISK GIVE YOU FREE* SPECIALLY DEVELOPED SOFTWARE FOR THE 65C02!
(*except media)
65C02 PATCH:
Using DEFFN such as DEFFN ("PLY"), extra instructions are added to the present BASIC assembler.
65C02 BASIC2 OVERLAY:
Providing you have a sideways RAM unit, this program will turn your BASIC2 instantly into 65C02 assembler. You do not have to type in 'OPT FN("PLY")' but simply 'PLY' instead, making the conversion job a piece of cake.
SOLIMON, THE ONLY 65C02 MACHINE CODE MONITOR:
This program can be softloaded into Sideways RAM or obtainable in ROM form. It has everything the popular EXMON has such as Disassembler, Find bytes/string, set ROM socket, spool, move, hard copy etc and also some 'impossible' features such as defining zero page location that will be used, single stepping sideways RAM, screen modes. More importantly, it works with the 65C02 and can even disassemble the second processor ROM!
IN VIEW OF THE LARGE DEMAND FOR THIS CHIP, SOLIDISK OFFERS IT AT ONLY £11.00+£1.00 FOR POST AND PACKING
THE ABOVE SOFTWARE IS AVAILABLE FROM US AT ONLY £2.50 TO COVER THE MEDIA COST OF THE DISKETTE. NO EXTRA POSTAGE WILL BE CHARGED IF ORDERED AT THE SAME TIME AS THE 65C02 CPU.

(It is understood that enquiries about the 65C02 CPU should be sent directly to us rather than to RCS, the Rockwell distributor.)

PRICE LISTS AND ORDERING (including P&P and VAT)

SIDEWAYS RAM:	
SWR16	£43.65
SWR32	£59.95
128K SOLIDISK	£150.95
256K SOLIDISK	£257.95
The following are upgrade prices for existing Sideways Ram Users:	
16 — 32 (return complete item)	£19.00
16 — SOLIDISK (return item)	£110.00
16 — SOLIDISK 256 (return item)	POA
32 — SOLIDISK	£95.00
32 — SOLIDISK 256 (return item)	POA
128 — 256 (return item)	£125.00
DFS AND DISK DRIVES:	
STL DDFS DISK UPGRADE	£39.95
DFDC Twin FDC version	£49.95
MITSUBISHI 2×80 (incl leads+manual)	£163.00
MITSUBISHI TWIN (incl leads+manual)	£323.00
65C02	12.00
65C02 software	2.00
COMPLETE SYSTEMS: (i.e. DRIVES+DDFS):	
MITSUBISHI 2×80 640K bytes	£202.95
MITSUBISHI TWIN 1.3 MB	£353.00
DISKETTES (Datalife Verbatim boxes of 10)	
SS/DD 40	£17.00
DS/DD 40	£23.00
SS/DD 80	£24.00
DS/DD 80	£29.00
EPROM PROGRAMMER (use with Swr or Solidisk)	£20.95
UVIPAC EPROM ERASER	£20.95
2764 PACK OF 5	£36.00
27128 PACK OF 3	£39.95

HOW TO ORDER?

You can order any item using the coupon. Prices are inclusive of VAT, post and packing. Access and Barclay card holders can place their order by phone.
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40/80 Track 400K Switchable TEAC 55	@ 329.82a
40/80 Track 800K Switchable TEC	@ 357.88a
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FLOPPY DISCS: (Boxes of ten)	
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PRINTER STAND:	@ 13.11c

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RGB CONVERSION KIT:
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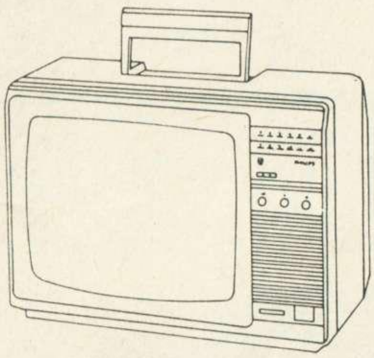
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Printer	1mt	@ 7.82c ea
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Parallel 26-26 pin	1mt	@ 7.59c ea
Parallel 26-26 pin	1.5mt	@ 8.74c ea
Parallel 26-26 pin	2mt	@ 9.43c ea
Serial 25 pin D type plug each end	2mt	@ 12.88c ea
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We also stock a wide range of electrical Components, i.e. I.C's/Caps/Connectors etc.



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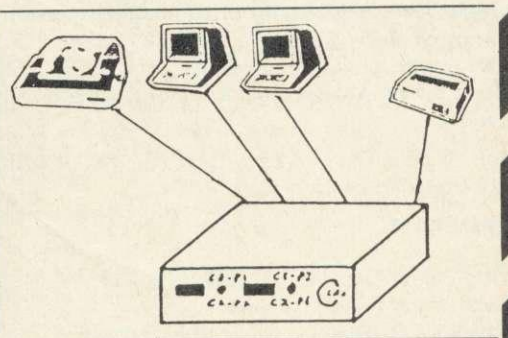
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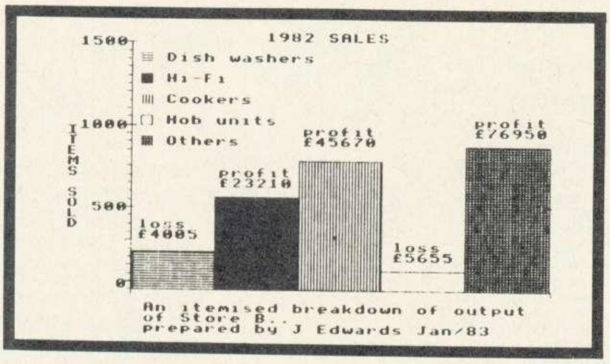
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PROFESSIONAL SOFTWARE FOR THE BBC MICRO

EASIPLOT

EASIPLOT is a sophisticated **AND** user friendly graph package for the BBC Micro, placed 14th in the top 20 Educational packages by the leading Educational Computing Magazine. EASIPLOT has also come to be regarded as an 'outstanding business package' and 'excellent value for money'.

Note:- **EASIPLOT** 3 comes complete with the number charting program **DATA PLOTTER** with graph magnification, colour and moving average facilities. SUPERB VALUE AT £22.95.



EASIPLOT FACILITES	DISK	CASSETTE
Line, Bar and Pie Charts	YES	YES
Auto & Manual Scaling	YES	YES
Grid & Scatter Options	YES	YES
No of simultaneous graphs	5	3
Overwrite memory	YES	NO
Screensave facility	YES	YES
Screendump facility	YES	YES
Fixed description per graph (char's)	up to 200	100
Full plot and axis editing	YES	YES
Save, Load & *CAT facilities	YES	YES
Single file selection	YES	NO
Operating Manual (pages)	52	52

All our programs will produce hard copy on the following printers:- EPSON (entire range), Shinwa CP80, Star DP 510, Seikosha (GP80A & GP100A). Share Analyser will produce reports on any BBC compatible printer.

PLEASE NOTE:- Our programs CANNOT BE OBTAINED FROM YOUR LOCAL DEALER so send for details NOW.

PROGRAM	PRICE
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Data Plotter (disk) .. Model B	£8.00
Easiplot 1 (cassette) .. Model B & Electron	£15.95
Easiplot 2 (disk only) .. Model B	£19.95
Easiplot 3 (including Data Plotter-disk only)	£22.95
Share Analyser (cassette) .. Model B & Electron	£14.95
Share Analyser (disk only) .. Model B	£19.95

Disk orders .. please state 40 or 80 track (add £1 for 80 track and £1.50 for overseas orders). We will upgrade Easiplot 1 to Easiplot 2 for £7 (£10 to Easiplot 3).

Write for full details of all our programs or leave your name and address with our Answerphone service (Luton 33858).
All programs are normally despatched within 24 hours.

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SHARE ANALYSER is a sophisticated portfolio reporting and share analysis package designed for the small investor. The disk version has a capacity of 20,000 SHARE PRICES and up to 320 buy/sell deals covering 20 share names. Share Analyser has facilities for profit flexing and multiple merging of graphs and a variety of selectable indicators. **SHARE ANALYSER IS A MUST FOR THE INVESTOR AT A BARGAIN PRICE.**

PROFIT STATEMENT

NAME BRITISH PETROLEUM

	DEALINGS	
Bought	Av Price	Cost
600	338	2028
Sold	Av Price	Income
300	426	1278
Held	Curr Price	Mkt Valn
300	438	1314
	Gross Profit	564
	Income	257
	Expenses	101
	Net Profit	720
		% Gain = 36

SHARE ANALYSER FACILITIES	DISK	CASSETTE
No of prices stored	20,000	Appx 1700
Max no' of Holdings	20	20
Transactions per holding	16	16
Range adjuster	YES	NO
File Manager	YES	NO
Printer Manager	YES	NO
REPORTS PRODUCED:-		
Portfolio Valuation	YES	YES
Portfolio Profit Analysis	YES	YES
Share Profit Analysis	YES	YES
Share Movement Analysis	YES	YES
Transaction Record Report	YES	NO
File Status Report	YES	NO
GRAPHICS FACILITIES:-		
Magnification option	YES	YES
Grid	YES	YES
Autoscale	YES	YES
Screenwrite	YES	YES
Screendump	YES	YES
SELECTABLE GRAPHICAL INDICATORS:-		
Lagged Moving Average	YES	YES
Centred Moving Average	YES	YES
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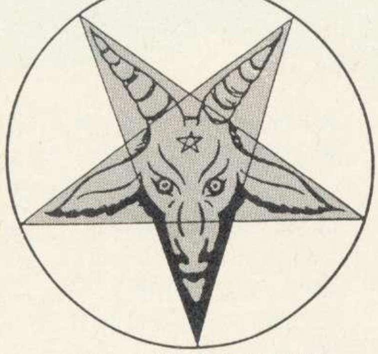
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If you do you will find yourself alone and at the mercy of the twisted fancies and whims of a cold and calculating mind.
Occult forces are threatening the lives of those near and dear to you. Their only salvation rests in your hands but in accepting the challenge your own existence is put in severe peril.
In taking up the challenge you have to find The TALISMAN and locate a pentagram which then has to be prepared for the final rite. In the meantime dark forces will be opposing you making a difficult task almost impossible.
Do not allow yourself to be lulled into a sense of security for it will be short lived.
Many have gone before only to swell the ranks of the damned.
This is the latest adventure from the stables of Microtest and has been written with the acclaimed features of other adventures in mind eg save facility, quick response, simple but extensive commands, a mixture of logical and friendish problems to solve.
Be warned this is an easy adventure to get into but devilishly difficult to end.
Cassette £7.95 inc. VAT Disc £9.45 inc. VAT + p&p 50p Disc 40 or 80 Track.

MICROTEST FONT ROM

This exciting new ROM from Microtest will enable you to get all sorts of new characters and fonts from your BBC Computer. Once you have produced your masterpiece on the screen, all you have to do is use the inbuilt screendump utility to produce a hard copy on to paper.

Typing *HELP FONTS gives you a list of available fonts and the blocks of characters which they replace.

Available fonts are:

***Accents**	Accents and miscellaneous.
***Block**	Small capitals.
***Data**	Like the bottoms of cheques.
***Greek**	It's all Greek to me too!
***Joined**	Standard capitals with joined up lower case.
***Maths**	A mix of until now unobtainable Mathematical symbols.
***Miscellaneous**	A few oddities which often are very necessary.
***Thick**	Thick text (for MODEs 0&3) to enhance 80 column mode.
***Thin**	Thin text (for MODEs 2&5) which makes modes 2 & 5 much more readable or perhaps "READABLE".
***Vertical**	For labelling graphs in a vertical plane.
***Mode 8**	10 column multi colour, memory miserly mode.
***S Dump**	A Dump facility which will produce a screen dump of any mode from 0 to 8 (including a text only dump in mode 7) on an epson, star, CP80, MT80 or JP80 etc etc. . .

The dump utility will produce negative or positive product, can magnify, and will also rotate the picture through 90 degrees as well as being able to position the picture anywhere laterally across the paper.

The ROM uses absolutely no user memory and can be used with word processors etc. as well as with normal word programs.

£17.50 inc. VAT + p&p 50p

Microtest Starstick ROM & Joystick Package

Now available the Starstick ROM and Joystick. This comes in three forms:



(A) The Starstick ROM and Quickshot I Joystick
Price 17.95 + VAT = 19.84
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(C) The Starstick ROM and patch lead, choose your own Spectrum/Atari style joystick
Price 15.25 + VAT = 17.54

Post and Packing £1.00 inc. VAT per item

This enables you to plug the Rapid action self centring joysticks until now only available for the Spectrum/Atari/CBM machines into the user port of the BBC. Model A users please note NO ANALOGUE INTERFACE REQUIRED.

Disc Users Note – pressing BREAK, SHIFT-BREAK or CONTROL BREAK does not modify or destroy the STARSTICK software so Disc Users please feel free to Boot!

The software patch provided in the ROM is interrupt driven and adds the following commands to your computer.

Enables you to use our joysticks even on programs that do not offer joystick capability.



- ★ STICK turn on the STARSTICK ROM
- ★ NSTICK turn off the STARSTICK ROM
- ★ SETSTICK set up joystick to users spec
- ★ SAVE "NAME" 140 160 saves your user-key protocols
- ★ ADVAL emulate standard analogue joysticks
- ★ PAUSE define key to Freeze game
- ★ NPAUSE turn off ability to freeze game
- ★ "NAME" predefined key protocols set up for software houses programs
- ★ HELP KEYS displays currently selected key protocols
- ★ REPEAT enables auto-repeat fire
- ★ NREPEAT disables auto-repeat fire

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Access

Large picture shows BBC Computer System and a Quickshot II Joystick. Small inset just a few of the joysticks that will work with the patch lead. Screenshot by kind permission of SUPERIOR SOFTWARE

All microtest ROMs are fully TUBE® compatible. (TUBE® is a reg trademark of Acorn Computers.)

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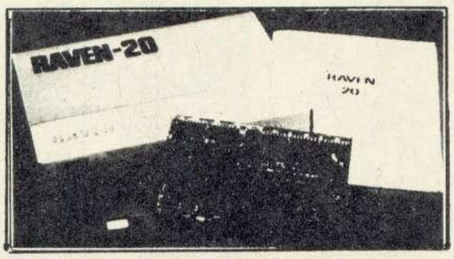
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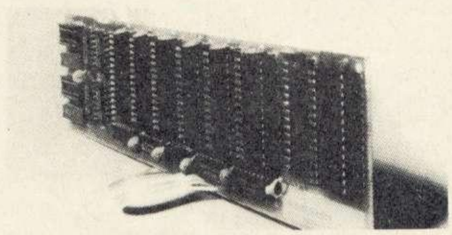
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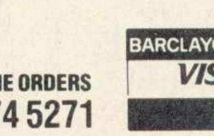
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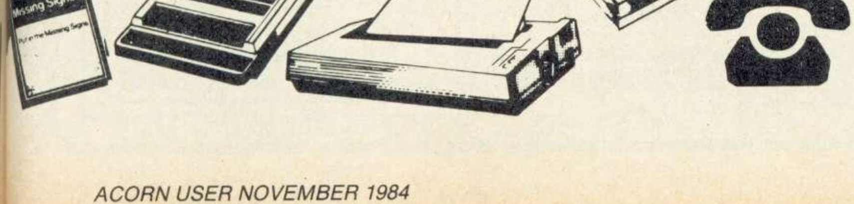
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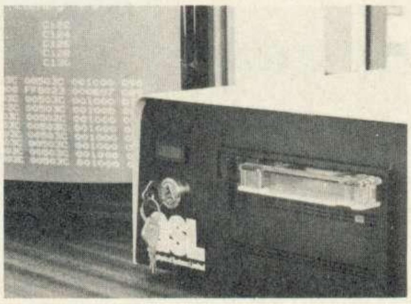
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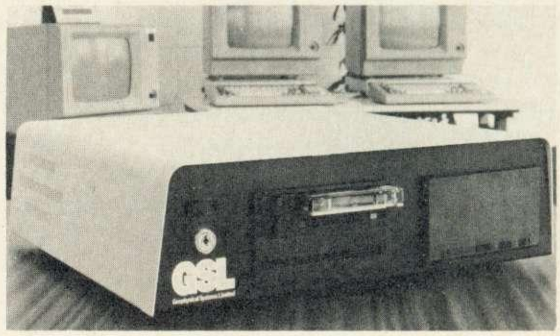
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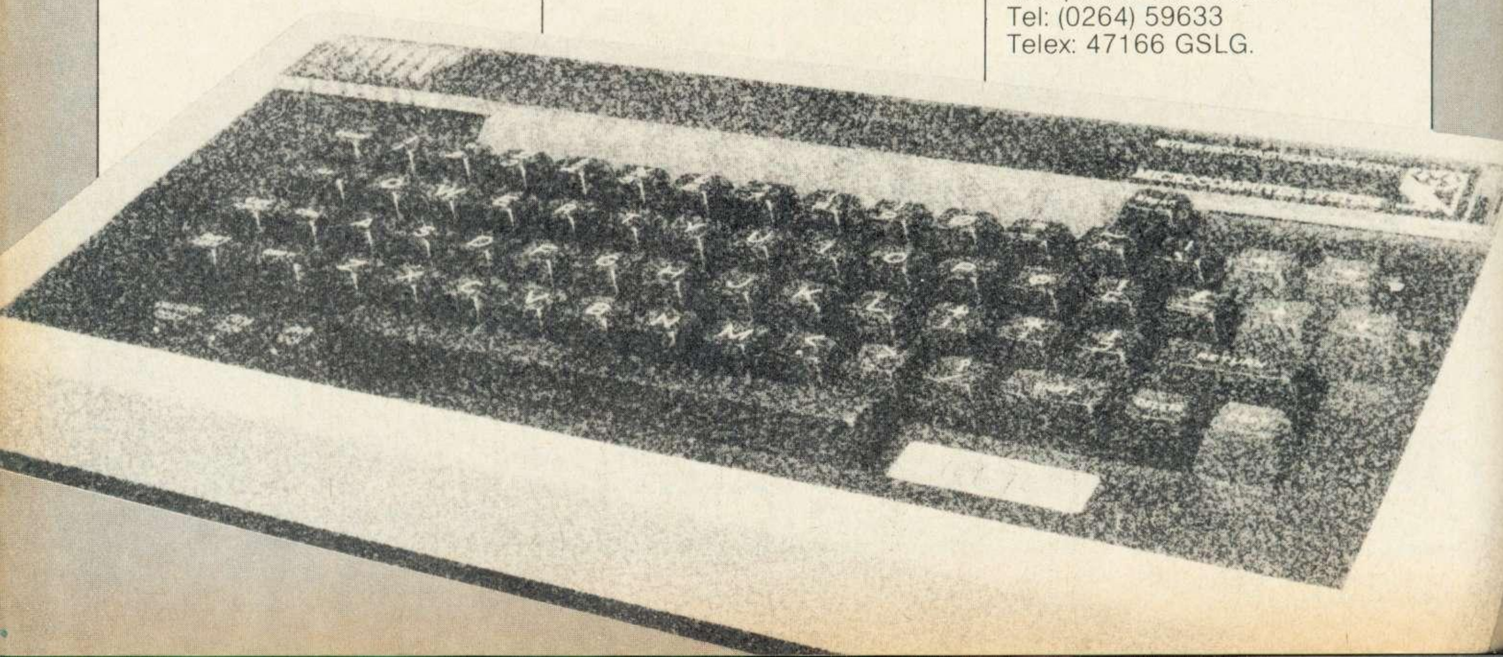
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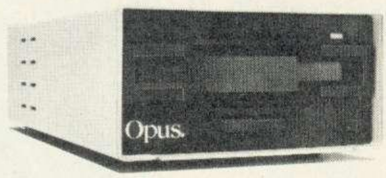
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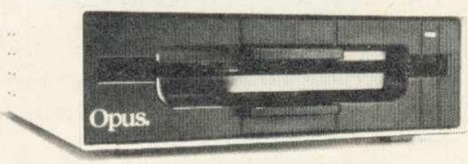
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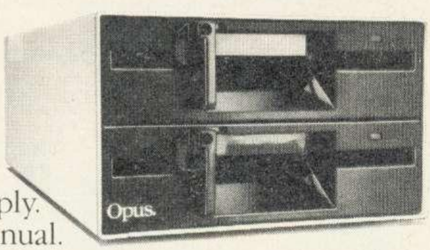
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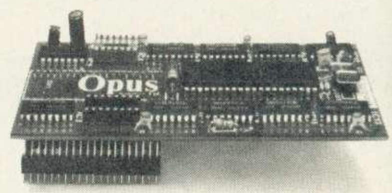
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FLOOR SHOW

Computer-controlled buggies are fun as well as being instructive. Geoff Nairn MOT-tests six models

IS YOUR BBC micro looking tired and listless? Bored with killing aliens and interrupting vectors? It can't be much fun being confined to the same old table-top day in and day out, so why not buy it some 'wheels'? For considerably less than a Mini Metro your Beeb can become mobile and explore the outside world – well, your room at least.

The six 'buggies' examined all move along the floor under direct control of the BBC micro. Some can draw lines, flash lights and make noises as they move. Others can even respond to the environment around them: searching out a light source with a photocell, or changing direction when they hit a wall. They all, however, provide a low-cost introduction to the world of robotics.

Where they differ considerably is in ease of use. Two of the buggies are 'turtles', a species that is easier to control and therefore likely to suit younger children. To make a turtle move forward, for example, you simply type FORWARD; to do the same with one of the cheaper buggies you need to address the user port directly – ?65120 = 6 for example. While the turtles are aimed at young children, buggies are more for experimenters who can program. This difference is reflected in the price – more than £170 for a turtle, £35 for the cheapest buggy.

The turtle has been around since the early seventies, when Seymour Papert proposed it as a suitable 'object-to-think-with' for young children using his Logo language. With the large-scale introduction of microcomputers into schools in the eighties, the first commercially available turtles were produced by Jessop Microelectronics. The original Seri version cost more than £350, though it could be used with a range of micros; the new Para, reviewed here, is half that price and currently only available for the BBC micro.

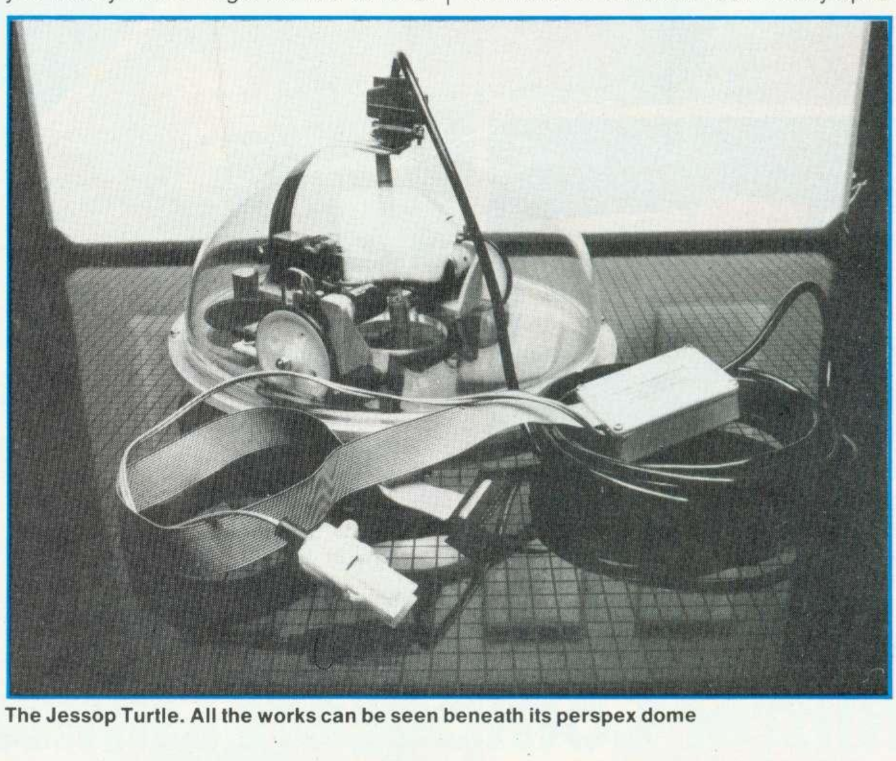
The Jessop Turtle – also called the Edinburgh Turtle – is elegantly simple: two motors to drive the wheels, another to lift a pen up and down, a small loudspeaker and a circuit board. A perspex dome lets you see how little there is inside and a long cable connects it to your Beeb. At the end of the cable is a small interface box that plugs into the user port. Power comes from the Beeb's auxiliary power socket – a 'splitter' cable means you can still power your disc drive.

To drive a turtle you need some software and to use it as Papert intended you really need Logo. At the time of writing there is no full implementation of Logo available for the BBC micro – so-called 'turtle graphics' programs are purely screen-based and can't control floor turtles. Jessop supplies a simulation of Logo called 'OKLogo', which is all right as an introduction to using the turtle but lacks many of the features found in full Logo. So to assess the Jessop Turtle more thoroughly I used Dart. Dart is also a Basic simulation of Logo, still rather rudimentary, but it will work with both the Jessop and Valiant Turtles.

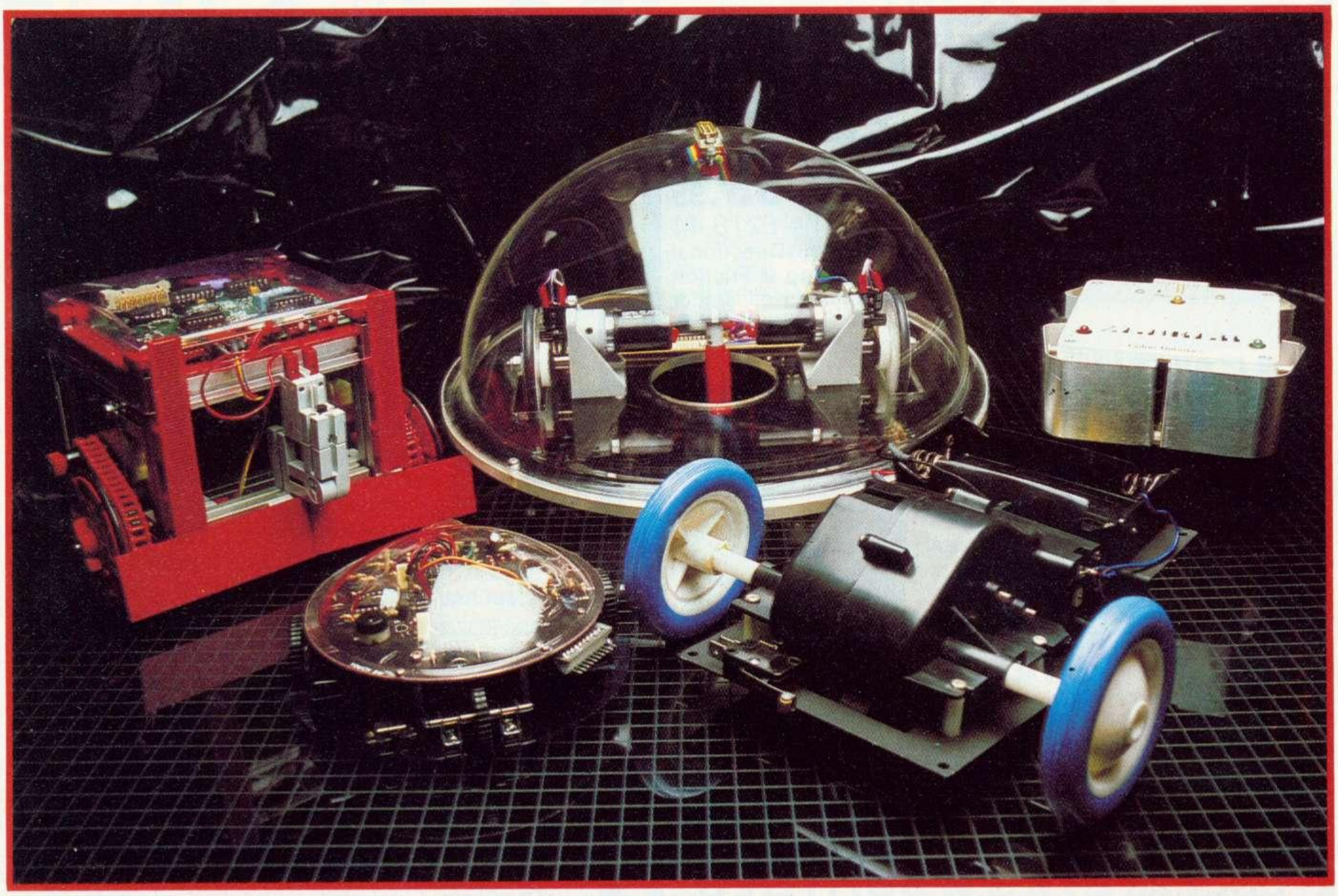
The other turtle, the Valiant Turtle, was launched in July this year – in the House of Commons, of all places! Although it costs about the same as the Jessop Turtle, it is a very different beast. To start with, it actually looks like a turtle, having flippers, a head with two eyes and a shell. It also has its power supply on board, in the form of ten nickel cadmium rechargeable batteries. When the turtle's eyes stop glowing then it's time to recharge the batteries, using the recharger supplied – one charge should give about four hours of continuous use.

Perhaps the most revolutionary feature of the Valiant Turtle is the absence of any cable connecting it to the computer. Instead, communication is by means of an infra-red link. The transmitter is a small box that plugs into the Beeb's RS432 socket and which is pointed in the general direction of the turtle. The turtle picks up the infra-red signal using phototransistors mounted inside its 'shell' and decodes it into appropriate movements.

Using an infra-red link means that the Valiant Turtle can roam freely up to

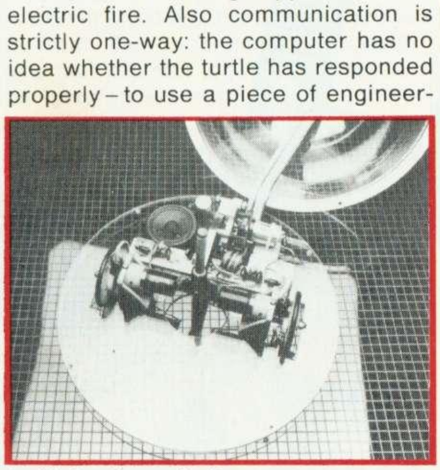


The Jessop Turtle. All the works can be seen beneath its perspex dome



ON THE GRID (left to right): Economatics' BBC Buggy; the Memocon Crawler, designed to be connected to a small keypad; the Jessop Turtle; Northern Computers' Micro Pulse Buggy; and the Zeaker, with its pair of touch-sensitive bumpers

a range of about six metres; with the Jessop Turtle the cable often gets twisted or obstructs the turtle's path. One disadvantage to using infra-red is that in bright sunlight the signal gets swamped and the Valiant Turtle won't move; the same thing happens near an electric fire. Also communication is strictly one-way: the computer has no idea whether the turtle has responded properly – to use a piece of engineering jargon, there is no 'feedback'. If someone stands directly in the path of the infra-red beam or if the turtle hits an obstruction, the computer will quite happily go on sending out new instructions as if nothing had happened.



Inside the Jessop turtle

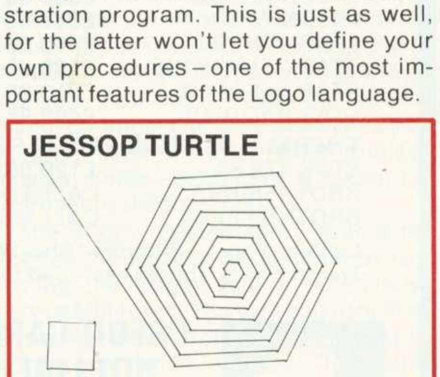
In contrast, the Jessop Turtle has optical sensors on the wheels that monitor whether they have turned the right amount; if they have, the turtle sends a signal to the computer via the cable that it's ready for the next instruction. If the turtle hits an object the wheels will not have turned their full amount; the computer has to wait until the object is removed and the robot can complete its move. This is the same principle as used in 'intelligent' robotic devices.

The feedback means that Jessop can get away with using DC motors, as any errors are corrected. The Valiant Turtle is fitted with expensive stepper motors, which are accurate enough not to need feedback. Unfortunately they consume quite a lot of power, hence the large number of rechargeable batteries.

On the subject of accuracy, both turtles can be fine-tuned to compensate for mechanical tolerances. This is done by programming the turtle to draw a square; if the finish point does not coincide with the start then the wheel track can be adjusted with a small spanner. With both the Valiant and Jessop turtles supplied this was not necessary.

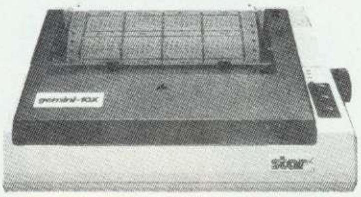
One intriguing difference is in the distance each turtle moved when told to 'FORWARD 10'. The Jessop moved 3.7cm, whereas the Valiant moved 4.7cm. When used as an educational tool, the absolute distances don't really matter, just as long as 10 Logo units are twice as big as five units, and both models performed well in this respect. The Valiant was the slower, but not significantly so.

Other differences? Well, the Valiant Turtle does not have a loudspeaker, so it cannot 'HOOT' – a Logo command. Also it will work only on a smooth surface, not carpets. Provided with the Valiant is the Dart software mentioned above, as well as Valiant's own demonstration program. This is just as well, for the latter won't let you define your own procedures – one of the most important features of the Logo language.



How two turtles coped when programmed to draw the same recursive spiral shape using Logo commands. Note how on the Valiant turtle the steps are larger.

star ATTRACTIONS



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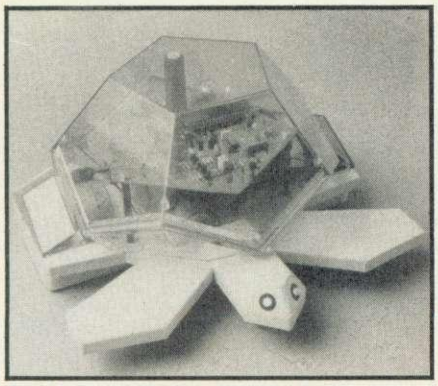
Vehicle	Logo	Hoot	Lights	Bumpers	Pen-arm	Power supply	Link	Special features	Optional extras
Jessop Turtle	Yes	Yes	No	No	Yes	BBC	4m cable		
Valiant Turtle	Yes	No	No	No	Yes	Battery	Infra-red		
BBC Buggy	No	No	No	2	No	BBC	5m cable	Barcode reader, photocell	Pen arm, grab arm
Zeaker	No	Two-tone	Yes	6	Yes	Interface	2m cable		
Micro Pulse Buggy	No	No	No	1	No	Battery	2m cable	Other experiments	
Memocon Crawler	No	Yes	Yes	No	No	Battery	pre-programmed		Interface and software (late 1984)

Table 1. Facilities of the turtles and buggies

Which one to buy? Assuming both versions will work with the full Logos due this year, both are invaluable in teaching programming without tears. The Valiant Turtle has the great attraction of actually looking like a turtle and not having a restrictive umbilical cord. It's probably the better bet for use with young children. The Jessop comes from the minimalist school of turtle design, and I have a sneaking admiration for something so simple yet so powerful. As well as its conventional use as a floor turtle, the Jessop Turtle is a lovely demonstration of the engineering principle of feedback. Also its inner workings are easier to understand – and modify. Both these factors mean that the Jessop Turtle might find its way into a lot of secondary schools, as well as the traditional primary school market.

Moving on from turtles we come to the BBC Buggy, made by Economatics. This costs about the same as a turtle but is very different both to look at and use. Originally it was developed to demonstrate computer control in secondary schools. The major difference is that it can respond to the environment around it using a variety of sensors. As such it exhibits simple artificial intelligence – or rather the controlling program on the BBC micro does, for there is no 'on-board' intelligence.

The BBC Buggy comes as a kit and is built around a chassis, much like the way they used to make motor-cars. On the Buggy this is cube-shaped and everything else is 'bolted' onto it. In fact no bolts are needed: the Buggy is made up from Fishertechnik construction parts that just slot together. Construction is relatively simple once you've



The Valiant Turtle actually looks like a turtle, and there's no cable!

identified the various components, which tend to have names like 'angle block isosceles' and 'crawler track link'. The circuit boards come ready-made, and the various leads just need plugging in – you don't even need a soldering iron. The Buggy can be built in a couple of evenings, and no mechanical modifications are necessary – apart from maybe adjusting the wheel track by adding a washer to the axle.

The Buggy connects to your Beeb via a long ribbon cable and an interface board. It uses both the user port and analogue port, and takes its power from the auxiliary power socket.

The software supplied consists of a dozen or so programs demonstrating some of the Buggy's capabilities. They are all written in Basic and can be modified. The first one simply tests the Buggy to see if everything is working correctly and also familiarises you with how it works. Control is by means of the cursor keys: pressing the up arrow makes the buggy go forward, and so on. When turning, one stepper motor goes forwards and the other backwards. This means that the BBC Buggy can accurately turn on the spot. Routes can be stored in the computer's memory and so can be repeated, and you can reverse the Buggy's movements to retrace a route. Other programs let you plan your journey on the screen and then get the Buggy to follow it on the floor, with suitable scaling of movements.

The other programs use the onboard sensors: two bumpers, a photocell and a bar-code reader. One of the programs uses the bumpers to find an object on the floor. You tell the Buggy how large the area to search is and it then goes off to find the object. It does this by moving up and down until one of the bumpers hits something. This closes a microswitch and the Buggy backs off, moves along a bit and tries again. This process is repeated until the Buggy has found all four sides of the object, which it then joins up on the screen and announces that it has found its prey. Often it gets the shape completely wrong – for example, if one of the wheels slips then it loses all sense of direction. Even so, this is a vivid demonstration of simple artificial intelligence.

A photocell can be mounted on the front of the Buggy and used to search out a source of light, such as a torch. Another program uses the photocell to make the Buggy follow a white line drawn on the floor. When the Buggy strays off it and onto the much darker floor, the photocell detects less light and this information goes back to the computer. The program then changes the Buggy's direction to try and find the line again. This is a typical 'feedback' control system.

A bar-code reader can similarly be attached to the front and then used for inputting bar codes into the Beeb. As the Buggy moves, it crosses large playing-card versions of those bar codes found on soup tins and the like. One program uses this information to play musical tunes – each card is coded to represent a different note.

The Buggy I tested had a grab arm fitted to the front as an optional extra, turning the Buggy into a potentially very useful robot. The arm consists of a horizontal beam onto which is fixed a simple open-and-close jaw. The beam is mounted just above the bumpers and can be raised or lowered by means of two motors; another motor opens or closes the jaws. An extra circuit board is needed to control the grab arm and this fixes vertically onto the back of the Buggy. Some adjustment is necessary to get the jaw and beam moving properly, but once working it is capable of lifting small, light objects.

To operate the arm the function keys are used – up, down, open and close. Some of the original programs for the Buggy, which were developed before the grab arm came along, switch it on

Vehicle	Price	Motor accuracy	Software	Ease of use	Ease of construction	Documentation	Comments
Jessop Turtle	£182	8	7	7	ready assembled	7	Simple, elegant design. Cable can get twisted.
Valiant Turtle	£228 (£171 to schools)	8	8	7	ready assembled	9	Looks like a turtle. Infra-red link allows free movement over wider area. Will not work in strong sunlight or on carpet.
BBC Buggy	£189 kit	8	8	6	7	7	Bumpers and photocell enable it to sense environment around.
Zeaker	£70 kit (£100 ready built)	5	3	4	4	4	Less sophisticated version of above. A good choice for experimenters.
Micro Pulse Buggy	£132 for buggy and interface	3	5	4	ready assembled	6	Buggy cannot be used alone – uses Youngtrainer interface. Several other experiments included.
Memocon Crawler	£35 kit	3	0	2	4	3	No interface. Needs modifying, so only for technically competent.

Table 2. Price and ratings table (out of 10) for the turtles and buggies under review

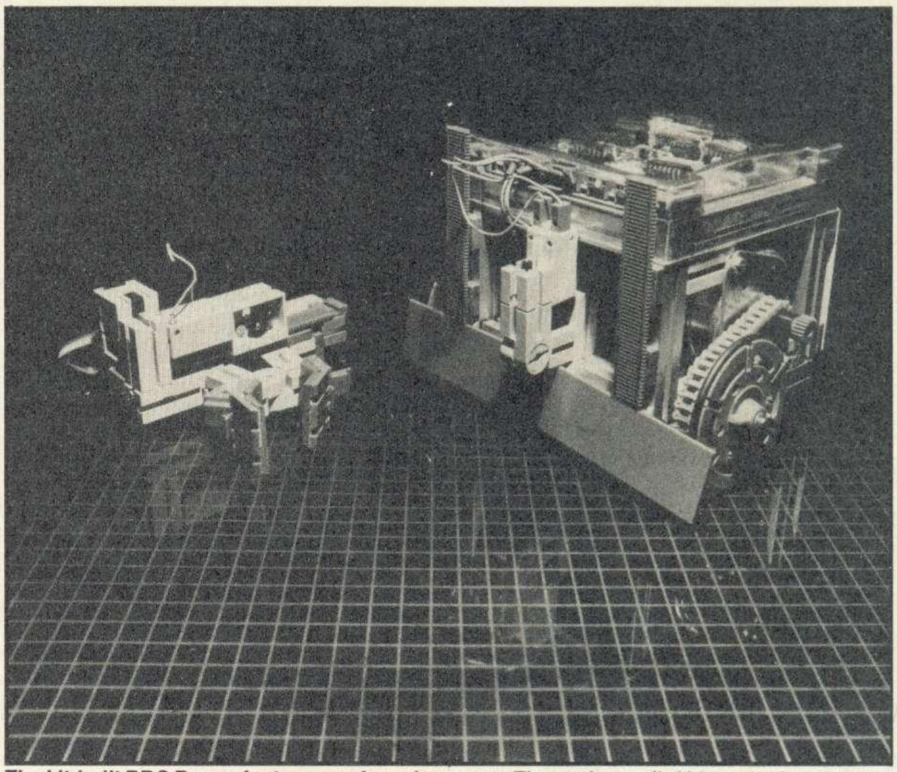
when they shouldn't. This bug is attributed to a prototype arm and software and will apparently be ironed out before the grab arm goes on sale. A pen arm, which allows the Buggy to draw out the route followed, is also available.

All in all, the Buggy is a very versatile machine. For those who know little about programming and interfacing, the software supplied lets them explore some of the concepts of robotics and computer control. But both the Buggy and its software are sufficiently accessible to allow the more experienced plenty of scope for experimentation.

Zeaker is a small, low-cost buggy that started life as a construction project in an electronics magazine. As a kit it costs £70, though you can buy it now ready-made for £100.

From the outside there is not much to see, just a white plastic box with two small tyres and four wraparound aluminium bumpers at each corner. A ribbon cable plugs into a socket in the top and this connects to the 'Zeaker Control Station'. This contains the interface circuitry and nickel-cadmium batteries which supply power to Zeaker through the ribbon cable. The control station then plugs into the parallel printer port and user port.

Zeaker, like the BBC Buggy, is both an input and output device – hence the two port connections. It contains two DC motors which can be driven forwards or backwards independently. It also has two LEDs on top which I suppose are meant to be 'navigation lights', as one is red and one is green. A speaker inside can sound two different

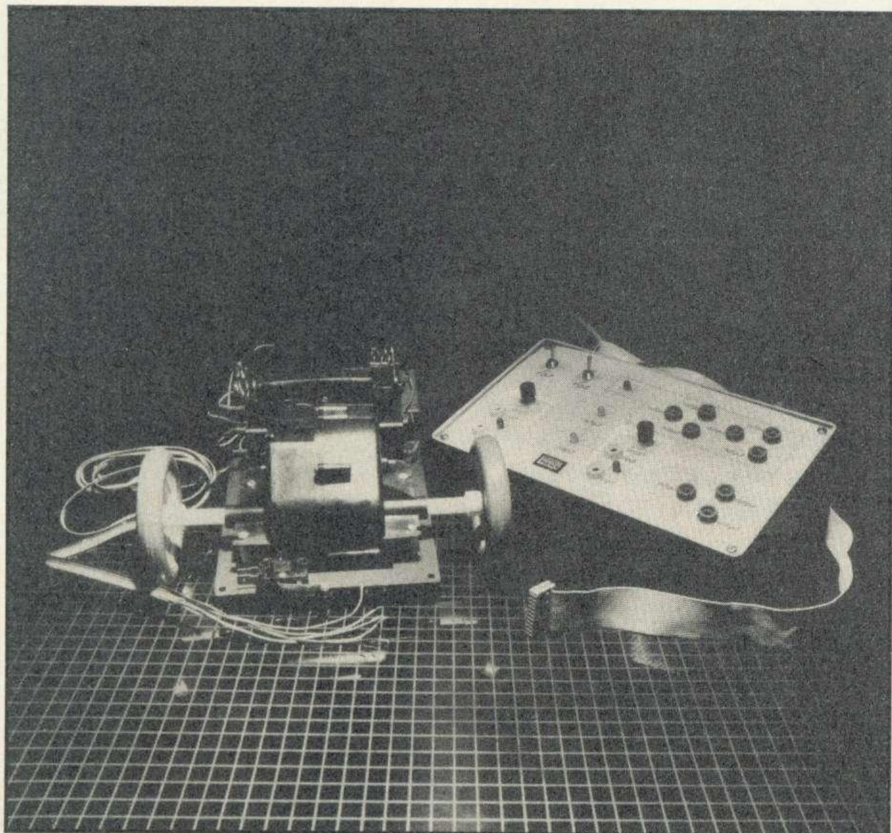


The kit-built BBC Buggy features on-board sensors. The grab arm (left) is an optional extra

tones and a pen can be raised or lowered through a hole in the underside. All these functions are turned on or off using the Beeb's printer port.

Input comes from the bumpers and is routed via the user port. Hitting a bumper pushes it back onto a bolt-head behind and completes an electrical circuit – simple but effective. Each front bumper simulates two switches: if Zeaker hits something head-on one switch closes, from the side the other closes, and on the corner both close. The two back bumpers operate one switch each. Add that up and you get six switches, so there is still room for another two inputs – or two outputs if you reconfigure the user port.

Two simple demonstration programs are supplied. The first just reads the user port and so displays the state of the bumpers as a single number – for



The Micro Pulse Buggy is one of several units that can be linked to the Youngtrainer interface box

example, 255 means no switch is closed. The other program lets you control Zeaker with simple commands ('F' for forwards, etc) and distances or angles. Both are really meant to give you an idea of how Zeaker is used in programs so that you can write your own.

Zeaker isn't the most accurate of buggies: the one I had experienced difficulty going in a straight line and the pen sometimes wouldn't come down when it was meant to. Nevertheless it's cheaper than the BBC Buggy and offers the same capabilities. You need to be able to write your own control programs to get the most from it, though.

More basic than Zeaker is the Micro Pulse Buggy from Northern Computers. This is not the most attractive of buggics – it looks like a large toy car which has had the top removed. Not surprisingly, it uses the same driving mechanism; two cheap electric motors magnetically coupled together to try to keep the buggy running in a straight line. On the front is a single microswitch bumper and perched on the back is the power supply – four batteries.

The buggy cannot be used on its own – you also need the Micro Pulse Youngtrainer. This is an interface box that plugs into the Beeb's user port and allows you to interface your Beeb to a variety of external inputs and outputs – not just the Micro Pulse buggy. A ribbon cable connects the buggy to the Youngtrainer and power for the latter can come from the BBC micro or an external power supply.

The Micro Pulse buggy is very basic; the program supplied just allowed it to go forwards or backwards, though if it hit an obstacle it stopped and reversed a small distance. The large blue tyres slipped occasionally and the Buggy could not travel in a straight line for any distance.

The complete package of buggy, Youngtrainer and leads will set you back more than £130. This may seem expensive but the Youngtrainer comes with about a dozen other interface projects. Plastic overlays can be placed over the Youngtrainer's front panel to simulate various different control situations: a traffic light, a washing machine, etc. Software is supplied for each simulation, and a teaching manual is also included, as the Youngtrainer is again aimed at the education market. The buggy is really a small part of the whole system, though it can be bought separately (£23) if you fancy supplying your own interface and software.

Our last buggy is not designed to be connected to a computer at all. Prism's Memocon Crawler is a self-contained electronic toy which runs around the floor, but with some modification you can connect it up to your Beeb.

It comes as a kit of parts and the only assembly problem is in understanding the pidgin English used in the instructions. When complete it resembles a flying saucer with wheels, but the most noticeable feature is an edge connector protruding from the Memocon. Into this is plugged a small hand-held keypad, and using the five keys you can program up to 256 steps into the Memocon's massive 1/4k of internal memory. At each step it can move forward, left or right, sound a 'beep' or flash a light. Pull the plug out and the Memocon goes away and runs through the program – over and over again, until you switch it off.

By chopping off the keyboard you can expose the data lines for the Crawler and *hey-presto!* you have a £35 buggy to plug into your computer. I ran it through the Youngtrainer mentioned above and downloaded the program steps from the BBC. You can even plug it directly into the user port but you need to know what you're doing (a circuit diagram comes with the Crawler). Also you have to write your own driver program. There are plans to market a ready-made interface and software, but that spoils all the fun.

About the only thing all these buggies have in common is two wheels. The turtles just move across a piece of paper drawing lines, yet are perhaps the most revolutionary tool in computer education. The BBC Buggy is a sophisticated – and expensive – demonstration of digital control. Zeaker is a do it yourself version of the Buggy and the Micro Pulse Buggy is a real 'no frills' runaround. The Memocon Crawler is guaranteed to frighten the dog. Take your pick.

SUPPLIERS

Jessop Turtle
Jessop Microelectronics, Unit 5, 7 Long St, London E2 8HN.

Valiant Turtle
Valiant Designs, Park House, 140 Battersea Park Rd, London SW11 4NB.

BBC Buggy
Economatics, 4 Orgreave Cres, Dore House Industrial Estate, Sheffield S13 9NQ.

Zeaker
Kit: Innervonics, 147 Upland Rd, London SE22 0DF.
Ready-built: Inter Galactic Robots, Highbury Workshops, Unit 208, 22 Highbury Grove, London N5 2EE.

Micro Pulse Buggy
Northern Computers, Churchfield Rd, Frodsham, Cheshire WA6 6RD.

Memocon Crawler
Prism Consumer Products, Prism House, 18–29 Mora St, London EC1V 8BT.

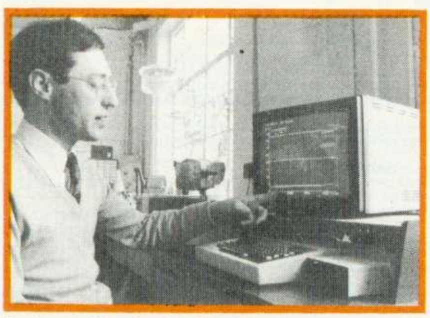
HOTHOUSE BEEBS

Danny Green explains how BBC micros are being used at Reading University to monitor plantlife

DEEP in the Berkshire countryside, BBC micros are looking after weeds and chocolate plants.

The poor weeds are sweating it out on a hotplate while cocoa bushes get the kid-glove treatment in a computer-controlled glasshouse.

At the University of Reading's Department of Agriculture and Horticulture, Andrew Murdoch is turning the heat on the nasties of the garden. But he's not interested in torturing weeds – he wants to find out how temperature wakes up dormant seeds, and how their growth varies with how hot they are.



Andrew Murdoch checks the progress of his weeds

Andrew is using a BBC micro to monitor the temperature of growing plants. It's not an easy job. The weeds are sitting on a square copper plate. The plate is heated on one side and cooled on the opposite side. The whole outfit is linked to a programmable clock. Every now and then, the heating and cooling arrangement is turned through right angles and after a while turned back again. The overall result is called a two-dimensional temperature gradient, and it is the Beeb's job to follow and record the complicated changes of temperature at 169 points on the plate.



Dr Mike Smith programs his Modec monitor and control unit

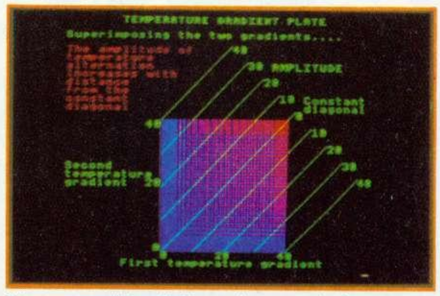
The system has been running 24 hours a day for more than six months – with just a three-week break for Christmas.

The BBC micro is interfaced to the weed experiment using a box of electronic tricks built by Dr Mike Smith at Reading. Called a Modec, this is a programmable monitoring and control unit that can work with a variety of micros.

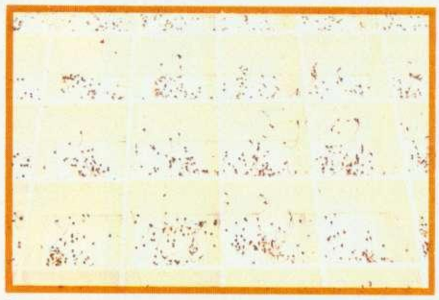
In the cocoa experiment, a couple of miles down the road, the BBC micro controls operations as well as monitoring them. It is taking over from an ancient Commodore Pet, and the scientists are taking the opportunity to improve the whole rig.

A combined monitoring and control system to control a greenhouse might work like this. Anemometers and platinum resistance thermometers measure wind speed and temperature. If the wind is too strong, the computer won't open any vents in the top of the greenhouse, and the vents stay shut if it's pouring with rain too.

Then the computer checks the temperature signals coming from the Modec. If it's between, say, 21°C and 22°C, all well and good. If it's too hot, a vent is opened for one second. The air in the greenhouse is given 10 seconds to calm down before the temperature is



Hi-res graphics follow changes in temperature



Turning the heat on weed seedlings

checked again. If it's still too hot, the process is repeated. It doesn't drop below 21°C very often, and if it does it's a matter of closing the vents tightly and waiting.

Both the weed-measuring and cocoa-controlling experiments use a BBC B with a single half-height floppy disc drive and a dot matrix printer. For the technically minded, a typical Modec is based on the 6809 microprocessor with a timer and 8k of RAM. It can have 64 inputs and outputs. Communications are via an RS232 link but, because the Modec is built to take a range of standard-sized modules, it is almost infinitely flexible.

Other experiments using the Modec at Reading University include monitoring the behaviour of badgers in their setts, counting the eggs laid by chickens, and simulating the climate of the Syrian desert in an almost ordinary greenhouse.

The big differences that using the BBC micro makes are cost and flexibility, says Andrew Murdoch. 'It's cheaper than other micro systems and more flexible than a multipoint chart recorder.'

'Other experiments at the university include monitoring the behaviour of badgers in their setts and counting the eggs laid by chickens'

A STAR IS BORN



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Consider the following features:

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Prestel mode features full colour Prestel graphics including double height and flashing characters. Full Telesoftware capability is offered allowing the many free programs offered by Micronet 800 to be downloaded into your computer. Pages of particular interest may be 'marked' for later retrieval and display. Page images may be copied and saved to a file on the current filing system.

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In terminal mode all input may be copied into a buffer in memory or spooled directly on to disc. Full control over buffered data is provided allowing it to be listed to screen or printer, sent to the RS423, saved to or loaded from the current filing system (including TAPE).
Commstar allows full configuration and easy control over the protocols used. Send and receive baud rates, word length, parity and number of stop bits are selected from a simple table of options.
When in chat mode (80 or 40 column), characters transmitted by the host will be displayed on the BBC screen and characters typed on the BBC will be sent to the host.
Commstar allows ANY type of file (not just ASCII) to be transferred 'safely' using XMODEM protocols. In fact, four individual methods of transmission are provided for within Commstar giving great flexibility.
Using a disk based 'emulation file' Commstar can be configured to emulate virtually any terminal type including VT100, within the capabilities of the BBC.
In addition to the above, most MOS commands can be executed from within Commstar, errors are trapped by Commstar's own error-handling routines and an optional elapsed time clock may be displayed. Data filter, Local Echo, Auto-line-feed, printer on/off and XON/XOFF protocols may be toggled in or out by a single key press, extensive use being made of the function keys.
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Toolstar sheds new light on your BBC micro
Toolstar, being Eprom-based will be permanently resident in your computer allowing all of its commands to be immediately available. It is 'transparent' to both the user and the operating system; once a command has been executed, control is returned to Basic, or whichever ROM had control prior to the command.
Full error handling has been incorporated and for new users there are full help menus describing each command and its syntax.

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Within *Toolstar* there are 22 commands, 8 of which operate between PAGE and TOP ie. on the current Basic program or Basic programming environment. These commands obey standard Basic command syntax rules.

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In addition to the commands described above there are 9 commands which operate on the whole of the BBC's memory and are designed to complement the BBC's built-in assembler. These include a full feature dissassembler and memory dump, each with forward and reverse scrolling.

If this is not enough *Toolstar* can be Extended!
There are three help menus on Toolstar which may be obtained by typing HELP TOOLS, *HELP MCODE or *HELP EXTEND. The third option menu will intially display the following:
*HELP EXTEND
EXTEND < RAM adds >
i.e. typing *EXTEND <address> will allow the user to extend the facilities of *Toolstar* with routines which are supplied by himself. The manual describes fully how this operation is carried out and illustrates it with several examples.
In the future such utilities will be made available on disc and cassette from Pace, thus allowing a comprehensive library of utility programs to be built-up.
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mes show no mercy.

Acornsoft have now unleashed eight more merciless games onto unsuspecting BBC micro owners.

Ranging from 'Gateway to Karos', where putting a foot wrong could mean instant death. To the relentless antics of Drogna which could have you dying with laughter.

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An adventure game in which you'll need all your patience and ingenuity just to stay alive. Your objective is to find the Talisman of Khoronz but, whichever path you choose, you'll be beset by treachery. Serpents lie in wait and magical phenomenona are in abundance. Should you find the Talisman, you've still to find your way back.

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You're in an arena littered with dormant lizards, killer bees and other hostile creatures with whom you'll have to do battle to survive. But beware of your own laser bullets, as they bounce off the arena walls.

Drogna.

A game for two people – preferably with devious minds. There are two vaults containing diamonds and your job is to collect and transfer them to your home base. While your opponent is out collecting you could sneak in and steal his loot... but keep an eye out for him doing the same to you.

Crazy Tracer.

An arcade style game where you're in charge of a paint roller. Guide your roller around a maze of rectangles while evading monsters who are committed to destroying it. Gain extra rollers and bonus points by painting different objects. But you'll have to avoid running out of paint.

Volcano.

Mount Crona has erupted after 150 years of silence. And your mission as an Emergency Rescue Helicopter Pilot is to save sightseers stranded on the slopes. Time is of the essence as the lava approaches the sightseers. But you'll have to take time to evade – or shoot – the boulders being hurled from the volcano.

Carousel.

A re-creation of the fairground shooting gallery – with a difference. Shoot down all the ducks, owls and rabbits before you run out of ammunition. Watch out for the low-flying ducks. If you fail to shoot these, they'll steal your bullets and reduce your chances of success.

Meteor Mission.

On an alien planet are six stranded astronauts. Launch your capsule from the Mothership and by avoiding – or shooting – meteors and alien craft, pick up the astronauts one at a time and return them to the Mothership.

All games – with the exception of Gateway to Karos which is currently only available on cassette – can be bought direct in either cassette or disc form. You will find all these programs at your local Acorn stockist. To find out where they are simply call 01-200 0200. Credit card holders, phone 01-200 0200, anytime. Or 0933 79300, during office hours.

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ACORNSOFT

AC 10

SOFTWARE CHART

	TITLE	PUBLISHER	PRICE	MICRO	REVIEWED
1 (1)	Frak!	Aardvark	£7.50	B	September '84
2 (2)	Fortress	Amcom	£8.95	B	September '84
3 (7)	Micro Olympics	Database	£6.95	B	
4 (5)	Football Manager	Addictive	£7.95	B	
5 (3)	Blagger	Alligata	£7.95	B/E	October '84
6 (11)	Overdrive	Superior	£7.95	B	September '84
7 (—)	Guardian	Alligata	£7.95	E	
8 (16)	Ghouls	Micro Power	£7.95	B/E	June '84
9 (8)	Aviator	Acornsoft	£14.95 (£17.95)	B	May '84
10 (6)	Chukkie Egg	A&F	£7.95	B/E	September '84
11 (—)	Dune Rider	Micro Power	£7.95	B	
12 (—)	Hulk	Adventure Int.	£7.95	B/E	
13 (re)	White Knight 11	BBCSoft	£11.50, £9.95	B/E	January '84
14 (—)	Quick Thinking	Mirrorsoft	£6.95	B/E	
15 (—)	Jet-power Jack	Micro Power	£7.95, £6.95	B/E	July '84
16 (—)	Colossal Adventure	Level 9	£9.90	B	February '84
17 (—)	Zalaga	Aardvark	£7.50		
18 (17)	Hunchback	Superior	£7.95 (£11.95)	B	September '84
19 (9)	Hobbit	Melbourne House	£14.95	B	
20 (—)	Blockbuster	Micro Power	£7.95, £6.95	B/E	

B=BBC. E=Electron. re=re-entry. Prices in brackets are for disc version. Where two prices appear, the second is for the Electron version.

BUBBLING UNDER

Drum Kit (Quicksilva)
Free Fall (Acornsoft)
Renegade (Robots Senator)
Star Striker (Superior)
World Geography (Superior)
System 15000 (Craig)

Compiled by RAM/Computer

'WE was robbed,' said a Database spokesman on hearing that *Micro Olympics* had been held off the number one spot by the dynamic duo *Frak!* and *Fortress*. *Micro Olympics* entered the charts at number 7 last month. *Frak!*, straight in at number one two months ago, looks unshakable and *Fortress* seems to be repelling all attacks on the number two spot.

Straight in from nowhere, Alligata's *Guardian* is the month's highest new entry with yet another variation on *Defender*. Among the deadlies which have to be zapped are the usual menagerie of baiters, swarmers, mutants, bombers, pods and landers. The highest official score is put at 350,000, though unconfirmed reports (read as cheats) clock in at over half a million.

The sudden nose-dive of Bug-Byte's *Twin-Kingdom Valley* out of the charts completely confirms our suspicions about adventurers: a fickle lot who, when no-one's looking, will drop their Tolkien, pick up the nearest pair of joysticks and proceed to zap mutant aliens like the best of us.

Go on then, prove us wrong: we expect to see Level 9's *Colossal Adventure* at least in the top 10 next month. Talking of Tolkien, Melbourne House's *Hobbit* has slipped from 9 to 19!

***Aviator* continues to circle round the middle reaches of the chart but could well be overtaken by Micro Power's *Dune Rider*, which entered the charts this month – our tip for the top three.**

***Elite* is a disappointment to the editor; it's still stranded in hyperspace collecting nubian slaves and has yet to enter your High Street shop, let alone the Top 20. Maybe next month?**

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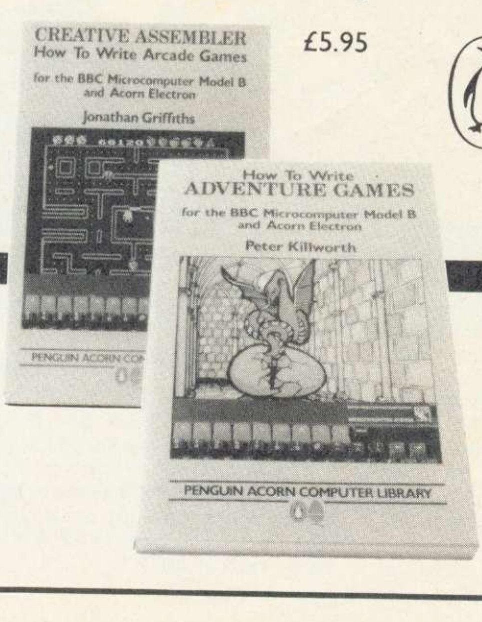
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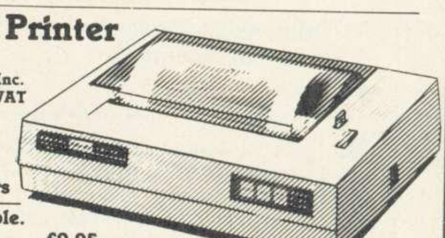


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CANNONS IN THE CANYON

'Eagle's Wing', Software Invasion, BBC B, £7.95 (£11.95 disc)



In 'Eagle's Wing' you have to fly between the canyon walls while pillboxes, ships, planes and missile launchers fire at you. The screen scrolls sideways under keyboard control

THERE you are, doing some daring low flying down the canyon, guns blazing, defence batteries blasting away at you, enemy planes attacking from all angles, but on you go, pausing only occasionally to dock with your sister ship (a bit unsavoury that, I thought) to refuel, re-arm and repair damage. Sounds familiar? If you were a resident of Teesdale when the NATO exercises are on it would. All except that bit about defence batteries.

Still, I have been promised a penknife for my next birthday. Watch out, Brylcreme boys!

If you like blatting anything that moves, this is your game. The screen scrolls sideways at a speed controlled by you (if, unlike me, you have mastery of the digits) and you have to steer a course between the canyon walls, while assorted pillboxes, ships, planes and missile launchers are being less than hospitable.

You have three kinds of blatter: air-to-air cannon, air-to-ground cannon, and air-to-ground missile. You have a limited supply of each, of course, and your fuel has a nasty tendency to run out. The object of your mission is to destroy the enemy missile silos and associated command centres (and to cause the inhabitants to write ferocious letters to the local *Bugle*).

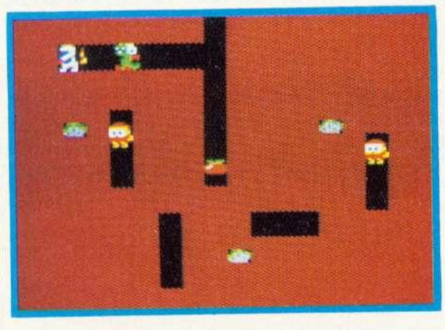
This is a really well-packaged game. It has tickertape-type instructions scrolling across the screen, and appropriately martial music – two tunes – playing while the main game is loading. The graphics are excellent: satisfying crump-type explosions, black at the centre, fringed with red and yellow. My son, Ghengis, plays it for hours at a time, as would I if only I could get my fingers under control.

There's a hall of fame and a demo facility to let you see what you're in for. Very good.

Harry Sinclair

PUMPING ALIENS

'Digger', Visions (Software Factory), BBC B (OS 1.2, £7.95)



NOW let me see. Red Goggle Aliens are called Footas. Green Dragons are called Pubars. Pumping is only done horizontally and each pump is neutralised by each 'pip'. Just as well I suppose. Right.

This game has got nothing to do with corks on your hat. You are an allotment-owner plagued by the aforementioned Footas and Pubars. They lurk underground but can't pass through the earth unless they turn into ghosts. You, on the other hand, are a bit of a whizz at tunnelling, and your pumping is of Olympic standard. Pubars can breathe fire and gamma rays which do you a power of no good.

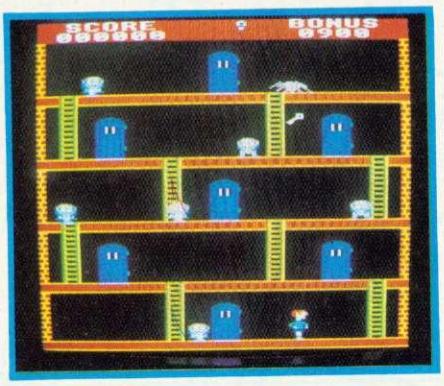
To destroy these bounders you can either pump them up and cause them to explode, or you can get more points by digging earth from under rocks and hoping that they fall and squash your foes. Success, as ever, only leads to greater torment. More and faster thingies harass you until it all becomes too much. This happened fairly early on.

I and my team of expert testers found the game rather uninspiring and initially difficult to fathom. I didn't know what was going on. Finding out didn't help much. It's OK, but not outstanding. I might even recommend it if, like the others, it wasn't so expensive.

Harry Sinclair

JAIL BAIT

'Spooks and Spiders', Software Invasion, BBC B, £7.95



SCENARIO: a prison block with several galleries. Locked cells, one of them containing a beautiful damsel. The key to the cells and the maiden's heart is there, but to get to it you have to avoid the ghosts of long-dead prisoners and awful-looking spiders. You can jump on the spiders though, acquiring points and dirty shoes in the process, but you have to make sure that neither they nor the ghosts jump on you or you will lose one of your three lives. Later on, some of the ghosts turn into fast-moving skulls which are very difficult indeed to avoid.

Having cunningly worked your way through to the key and grabbed it, you have to go to each cell door in a random sequence and unlock it. When you open the last cell, there is the grateful damsel. She's so grateful, in fact, that you have to do it all over again but this time there are even more spooks and spiders after you. All the time the bonus score is heading towards zero, as are your chances of survival.

The graphics are quite good and if you don't mind the fact that the storyline is probably fictional you could like this game. It will appeal to those who like Acornsoft's *Monsters*.

The package is nicely put together but, unlike *Eagle's Wing*, from the same stable or eyrie (please tick), it doesn't have the interrupt-driven music and graphics to entertain or irritate you while it is loading.

Harry Sinclair

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WP WITH AN ACCENT

Chris Drage in the international set

'BBtype', Furey Enterprise Products, Hildenborough, Kent TN11 9EY, BBC B (OS 1.0 or later), £23 inc VAT and p&p, cassette or disc

BBTYPE from Furey Enterprise Products is a multiple character-set WP written (in its current form) for the Epson MX, RX and FX ranges of printers, covering French, Italian, Spanish, German/Scandinavian, technical symbols and mathematical symbols.

It is designed for teachers, students, foreign correspondents and anyone who wants mainly to produce several copies of single sheets – for example, business letters or exam papers.

The package arrives in a flimsy box and appeared to be printed upside-down! Inverting the box and opening it revealed a C40 cassette, a BBkey with character set definitions and an instruction booklet (figure 1).

The cassette contains the source code, which must be copied onto a disc (or working cassette). The process is entirely automatic for disc users and it takes about 20 minutes to create a working disc. Cassette users must swap the two cassettes in the recorder and it can take up to 45 minutes.

Installation is not complete, however, until the Epson DIP switches are set to the following defaults: slashed zero; 11in page-length; forced line-feed with carriage return; computer control of printer; and English or USA character set. The instruction booklet is very helpful and guides you through step by step.

Once the working disc is 'booted' a menu appears with the character set options available. For the technical and mathematical options an additional option of ungapped print is given. This prints lines with no vertical spaces between them, enabling you to print large unbroken symbols for matrices (see keyboard printout, figure 2), determinants and integrals. It also improves the appearance of subscripts and superscripts. For ordinary text the normal option should be used.

Next, the printer must be switched on and put on line before the text screen appears. This is important as *BBtype* is not really designed to work without a printer.

The text screen comprises a blank 20-line 'window' of a page of text 66 lines long, each line holding 80 characters – bad news for owners of television sets as no 40-column alternative is available. A status line at the top of the screen gives information about current line, character set in use, in-file and out-file. Line 22 provides a reminder of the commands necessary to print, load, save and restart (figure 3).

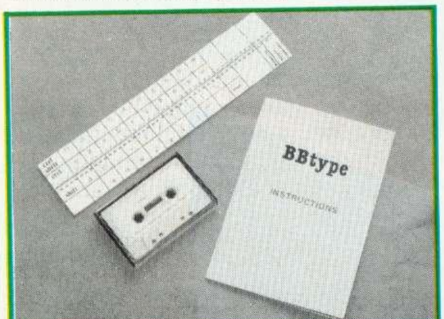


Figure 1. The BBtype package, with BBkey

As all special characters are available only through the function keys, the inclusion of the BBkey template booklet is welcome. It is clear, well-printed and easily managed. As with all BBkey function templates, it slips under the clear plastic strip above the Beeb's function keys and provides all the special characters and commands necessary to run *BBtype*.

Entering text is simple. Through a combination of the normal keys and function keys a page of text is quickly assembled. Each special character is displayed as it will appear in print. You move over the screen using the cursor keys, inserting text where you like. If you try to go 'off the bottom' or 'off the top' of the screen the window will move 10 lines up or down as appropriate, and you carry on. It's impossible to write beyond the bounds of the 66 × 80 'page', nor can the information at the top and bottom of the screen be overwritten.

Movements to the boundaries of the document are achieved by use of the CTRL plus cursor keys. Deletions are achieved through the use of the Delete key or by simply overtyping the text. Lines and characters may be deleted and inserted by use of Shift plus cursor keys. Care must be taken when inserting lines as any text pushed beyond the 66 line/80 character limit is irrevocably lost. Lines may be repeated by use of the Shift + CTRL + cursor down key.

Tab stops are limited to just three, which is not really adequate. Each may be defined by the user. The BBC's Tab key moves the cursor to the required stop. We have come to expect facilities such as justification, search/replace, paging and continuous processing to be available on all word processors. In *BBtype* they are simply not present, presumably due to lack of memory.

Printing is also simple. Press the Copy key. If there is text in the memory to print, it will appear exactly as you see it on the screen (figure 4). There are two minor exceptions, however: the number '7' prints barred for foreign character sets, and gaps between lines always appear on screen even though you opt to suppress them on printing. You must retrieve all text in order to print it. All printing takes place from memory. By using continuous stationery multiple copies are possible. If you require ten copies press the Copy key ten times.

Shift + Copy loads text, CTRL + Copy saves it. All filenames have a logical, common format. The directory letter is always the first letter of the character set in use – 'S' for Spanish, 'M' for

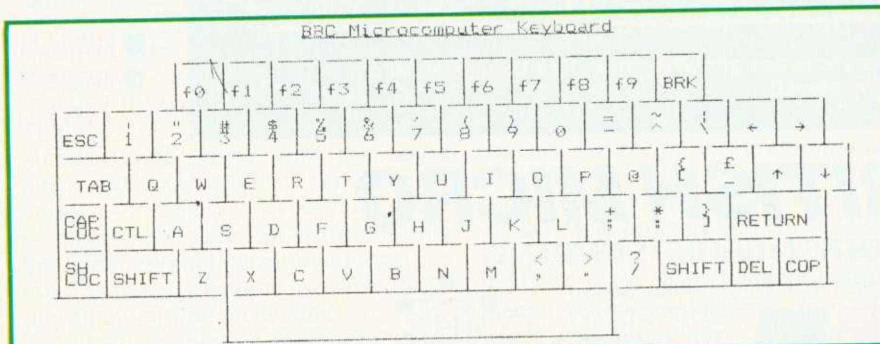
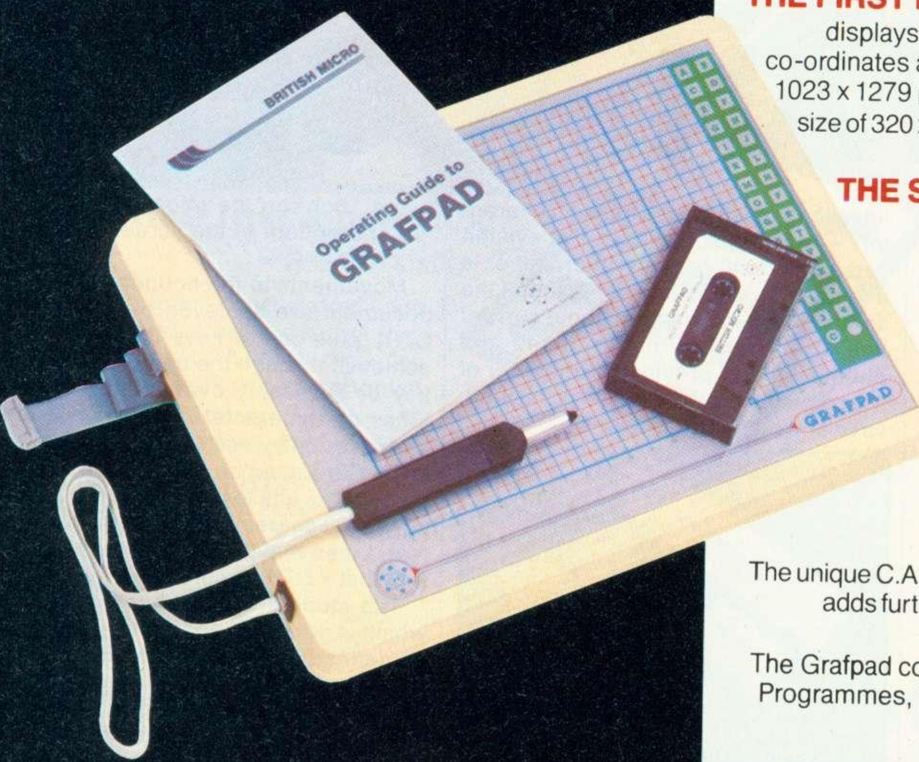


Figure 2. Sample printout using technical option

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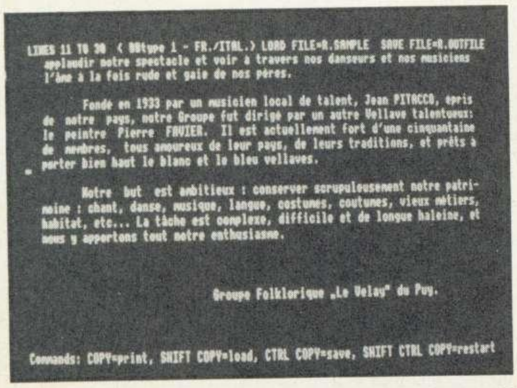
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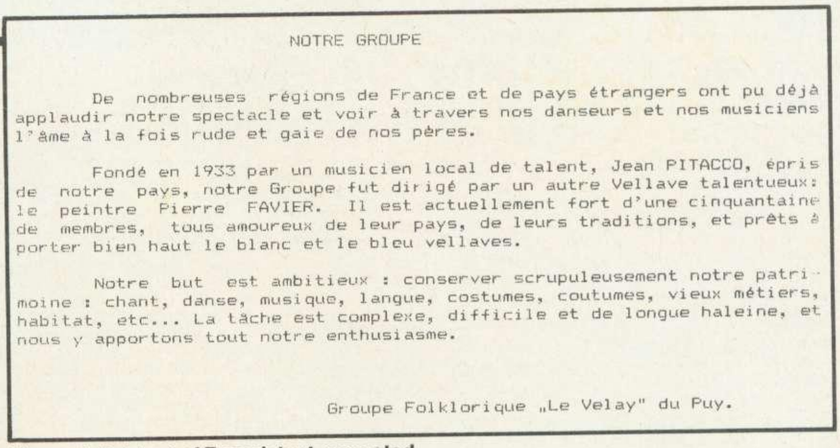
Fondé en 1933 par un musicien local de talent, Jean PITACCO, épris de notre pays, notre Groupe fut dirigé par un autre Vellave talentueux: le peintre Pierre FAVIER. Il est actuellement fort d'une cinquantaine de membres, tous amoureux de leur pays, de leurs traditions, et prêts à porter bien haut le blanc et le bleu vellaves.

Notre but est ambitieux : conserver scrupuleusement notre patrimoine : chant, danse, musique, langue, costumes, coutumes, vieux métiers, habitat, etc... La tâche est complexe, difficile et de longue haleine, et nous y apportons tout notre enthusiasme.

Groupe Folklorique „Le Velay" du Puy.

Commands: COPY=print, SHIFT COPY=load, CTRL COPY=save, SHIFT CTRL COPY=restart

Figure 3. BBtype text screen with reminder at line 22


NOTRE GROUPE

De nombreuses régions de France et de pays étrangers ont pu déjà applaudir notre spectacle et voir à travers nos danseurs et nos musiciens l'âme à la fois rude et gaie de nos pères.

Fondé en 1933 par un musicien local de talent, Jean PITACCO, épris de notre pays, notre Groupe fut dirigé par un autre Vellave talentueux: le peintre Pierre FAVIER. Il est actuellement fort d'une cinquantaine de membres, tous amoureux de leur pays, de leurs traditions, et prêts à porter bien haut le blanc et le bleu vellaves.

Notre but est ambitieux : conserver scrupuleusement notre patrimoine : chant, danse, musique, langue, costumes, coutumes, vieux métiers, habitat, etc... La tâche est complexe, difficile et de longue haleine, et nous y apportons tout notre enthusiasme.

Groupe Folklorique „Le Velay" du Puy.

Figure 4. Printout of French text, accented

mathematics and so on. A 'cold' start is achieved by pressing CTRL+Shift +Copy simultaneously: All irrevocable actions are trapped and you are given the choice whether or not to continue. The Break key is fully trapped. Nothing is lost from the accidental use of this key.

BBtype provides an exit mode. Pressing Escape allows you to wander 'off-stage' into Basic should you wish to perform some calculations or access the DFS commands. I found the *TYPE command invaluable here. It enables you to list any *BBtype* file for reference while you edit the current one. Typing RUN <RETURN> enables you to return to the text.

The 12-page A5 instruction booklet is clearly written and straightforward, providing useful tips such as how to mix character sets in one document. It also provides a good deal of assistance when things go wrong.

Clearly, *BBtype* is not a wordprocessor. Its lack of wordprocessing facilities places it firmly in the text editor bracket. Yet it provides a useful tool for anyone who needs characters other than normal English. Its lack of printer control codes is a limiting factor for those wishing to get the most from their Epson printers. Double printing is possible but many other printer facilities are not. Linguists and purists will complain that the capital letters are printed with accents, but in my experience it is something that most people do anyway. One application of *BBtype* that is not readily apparent is its uses for Gaelic-speaking people. I'm sure our Scottish, Welsh and Irish colleagues could use its French character set.

Educationalists will be disappointed to learn that *BBtype* will not function on the Econet Level 1 system.

BBtype allows the BBC micro to create and edit documents with non-standard characters in addition to the normal characters. At £23, though, it appears overpriced. Its general-purpose approach and use of cassette for the system master is to be commended. It is very user-friendly and failsafe. It is unfortunate that the limitations of the mode 3 screen permit only the most fundamental WP facilities.

A MINDER FOR ALL THOSE PROCEDURES

Source Library Manager (SLM) ROM, Guardian Software, 21 Harvey Road, Walton-on-Thames, Surrey, BBC micro, £36 (inc P&P)

'EVENING guv, nice 'ouse you got 'ere. Need any extension work doing – kitchen, loft? No? Well 'ow about your BBC micro? With all those extra ROMs you need the Acme backwards ROM expansion board. ROMs are easily removed with a chisel and it draws no power from the computer – instead it uses a 12-volt car battery discreetly mounted on the board. Guarantee? You trying to ruin me?'

So many ROMs seem to be coming onto the market these days that I wouldn't be surprised if I were subjected to this kind of spiel from a foot-in-the-door salesman. One of the recent additions is grandly called the *Source Library Manager – SLM* for short.

SLM is a ROM-based utility program that lets a programmer store commonly used procedures and routines on disc. Up to 199 such 'members' can be stored on a 40-track drive and these can be retrieved and then assembled together to form a program. You still need to add code to call these routines but nevertheless a lot of the slog of programming can be avoided.

The ROM chip is inserted in a spare sideways ROM socket – if there are none spare see special offer above – and it is accessed by *SLM. To show that the ROM is in use, a 'frame' appears around the screen consisting of the title 'Source Library Manager' at the top and a 'command' line at the bottom.

The 'Member Functions Menu' appears in this window and this contains the commands used most often. Assuming that before typing *SLM you had a piece of code on the screen, this can be saved to disc with the 'Create Source Member' option. You supply a name for the routine – up to eight characters – and a 20-character description. If you decide to change that routine, it can be retrieved off disc, modified and saved with the same name, but *SLM* will also keep the old version – in fact up to 99 versions of the same member can exist. Normally only the latest version is retrieved from the disc but there is a menu option to make any older version retrievable.

As well as 'source members' there are 'definition members'. A definition is a list of source member names that you want to use to make a program. Definition members, like source members, can be created, deleted and obtained from disc, and different versions can exist of the same definition member.

The most powerful feature of *SLM* is the 'Construct Defined Program' option: this will take a definition, fetch all the source members named in it from the disc and assemble all the pieces of code together, in order, so as to make up a program. All you then have to do is finish it off with a few lines to call the various procedures.

Once you've got the hang of the jargon used, *Source Library Manager* works very well and, being ROM-based, it takes up no user RAM. The disc capacity, in terms of the number of members that can be held, is a great improvement on the 31 files allowed by the DFS. For serious programmers who often find themselves using standard procedures in their programs, it will quicken this process and it's considerably easier than the method quoted in the BBC micro *User Guide* for merging pieces of code. However, few other users would be able to justify the £36 price-tag.

Geoff Nairn

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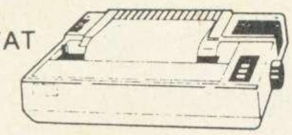
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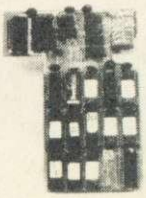
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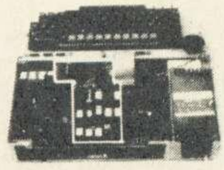
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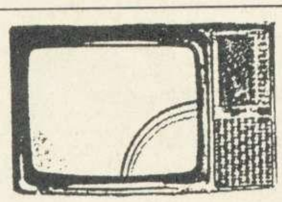




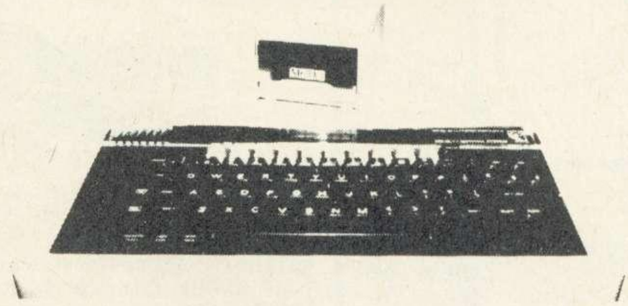
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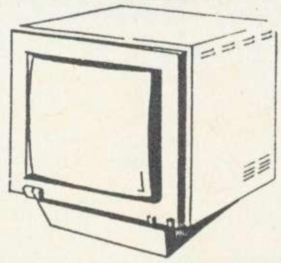
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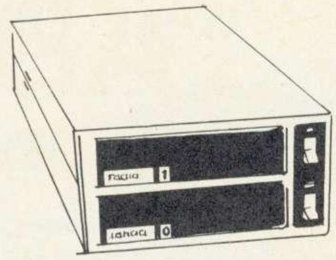
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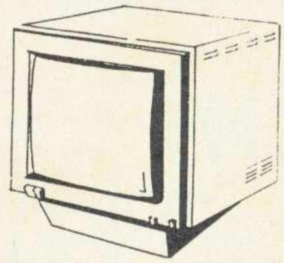


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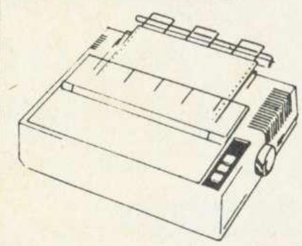
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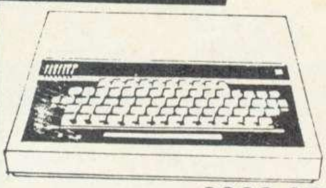
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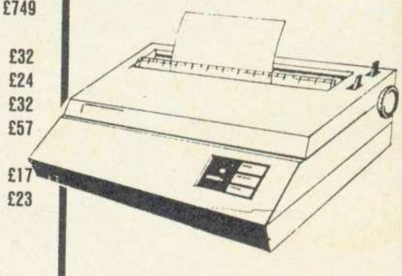
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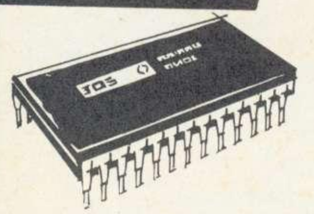
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TAKE TWO TABLETS

Malcolm Banthorpe draws practical conclusions in this comparative review of two inexpensive digitisers

Robot Plotter by Robot Computer Developments, National Industrial Estate, Bontoft Avenue, Hull HU5 4HF, tel: (0482) 448562, £59.50 inc VAT.

Tarren Digigraph Mk II by Tarren Products, Factory D1, Treforest Industrial Estate, Pontypridd, Mid Glam., CF37 5UR, tel: (0443 85) 3723/4, £86 plus VAT with cassette software, £91 plus VAT with disc software.

LIKE most of the digitisers currently available for the BBC micro, the two graphics tablets reviewed here work on the pantograph arm system. This system provides a cheaper alternative to the one used on the Grafpad type of tablet, where the position of the drawing stylus is detected by electromagnetic coupling between it and a grid of fine wires embedded in the tablet. While the accuracy of these pantograph devices is generally slightly lower and their physical construction makes them difficult to use for freehand drawing, they can be used quite efficiently to trace existing artwork for transfer to the screen.

Two potentiometers connected to the analogue input port supply all the information required to allow the position of the pointer at the free end of the jointed arm to be calculated by suitable software. As mentioned in my review of the Grafpad (May issue), one of the design problems to be overcome in making one of these digitisers is that the overall structure should be rigid enough to prevent errors due to flexing or backlash while still allowing the joints to rotate freely, so that diagrams and sketches can be easily traced. The standard of construction on both the Robot Plotter and Tarren Digigraph Mk II tablets was high and met the above requirements well.

Given that the hardware performs as it should, the usefulness of a graphics tablet is heavily dependent on the software used with it. The restricted memory available on the BBC micro when modes 0, 1 and 2 are used means that software designers cannot generally include all the features that they would like and must therefore decide which are going to be most useful and use their skill to include as many as possible, at the same time keeping the program friendly. The use of disc overlays or a second processor opens the door to greater freedom in graphics software design but commercial programs generally need to be usable by as many customers as possible. For the moment, then, they must be capable of running on unexpanded, cassette-based machines.

This review will therefore concentrate on the software aspect of the digitisers since this will probably be the deciding factor in whether they meet your requirements.

The Robot Plotter (figure 1) employs a transparent smoked perspex base board through which artwork can be traced. The software is supplied on cassette but includes a routine to facilitate its transfer to disc. The memory constraints of the micro mean that only graphics modes 4 and 5 can generally be used with a disc filing system. Another routine is included to move the program down to PAGE = &E00 once loaded from disc, so that modes 0, 1 and 2 can be used, but it will then not be possible to save or load pictures from disc.

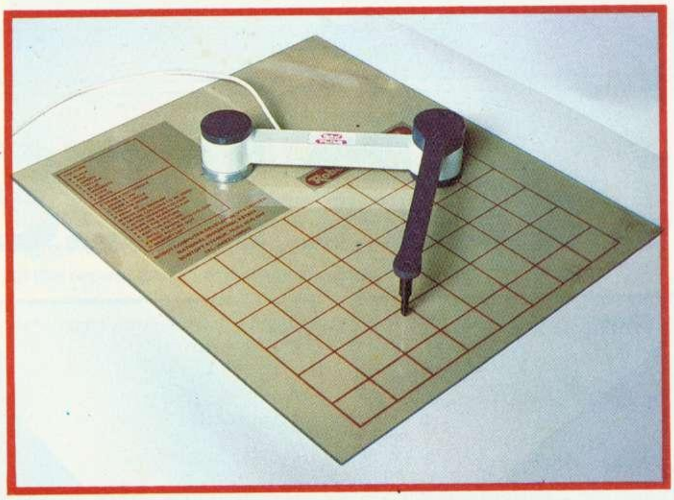


Figure 1. The Robot Plotter



Figure 2. The Tarren Digigraph Mk II

Once the main program has been loaded, prompts are displayed to calibrate the tablet by moving the pointer to the upper right and lower left corners of the grid and pressing return. The program then asks if extended mode is required. The main part of the program can operate either in a simple mode, allowing the more commonly used drawing commands to be accessed rapidly, generally with a single keystroke, or in extended mode where additional features are available and a single keystroke often presents several options.

Commands available in the simple mode include line, rectangle and circle drawing and 'follow', which allows irregular shapes such as maps to be traced. In each case the line or circle or rectangle is continually redrawn according to the pointer position until accepted by pressing the space bar. This feature is of considerable assistance in getting the pointer cor-

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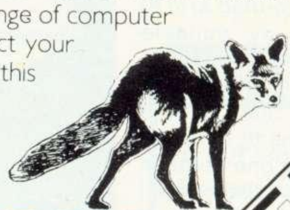


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rectly positioned. There is provision for entering text, which can be 'dragged' around the screen by the cursor and therefore positioned quite precisely. Enclosed shapes can be filled with a colour and at any point the drawing colour can be selected from any of those available to the graphics mode in use. The physical colour displayed by each logical colour can also be redefined.

Extended mode offers in addition the choice of dotted or solid lines and when 'line' is selected there is a choice of horizontal and vertical – useful in constructing diagrams – as well as sloping lines. 'Multicolour fill' gives the user the chance to define a 'super pixel' of four normal pixels, which greatly extends the number of colours or textures available for filling enclosed shapes.

One of the most useful features of this software is the way that each drawing instruction is memorised as it is executed, in both simple and extended modes. Thus all or part of a drawing can be repeated in a different screen position. A drawing can also be 'edited' by stepping through the memorised list of drawing instructions and either accepting or deleting each item. Pictures are stored on tape or disc as a series of drawing instructions rather than as a dump of screen memory and can therefore still be edited after storing and recall. Time taken to save or load a screen from tape is therefore reduced.

The instruction booklet lists two procedures that may be appended to the main program to allow screen dumps to either Seikosha or Epson printers.

The Tarren Digigraph Mk II (figure 2) has a wooden baseboard surfaced with white plastic laminate. Software can be supplied on either tape or disc, both allowing all graphics modes to be used.

The plotter is calibrated by positioning the pointer at each of three reference marks on the baseboard and pressing return. The height of the pointer is adjustable so that various thicknesses of paperwork, placed on the baseboard for tracing, can be accommodated.

The software supplied has a wide range of drawing options that allow the creation of almost any type of diagram to be tackled. The number of functions is too long to list in detail. Apart from the usual line/circle/rectangle/fill etc commands, options worthy of note are:

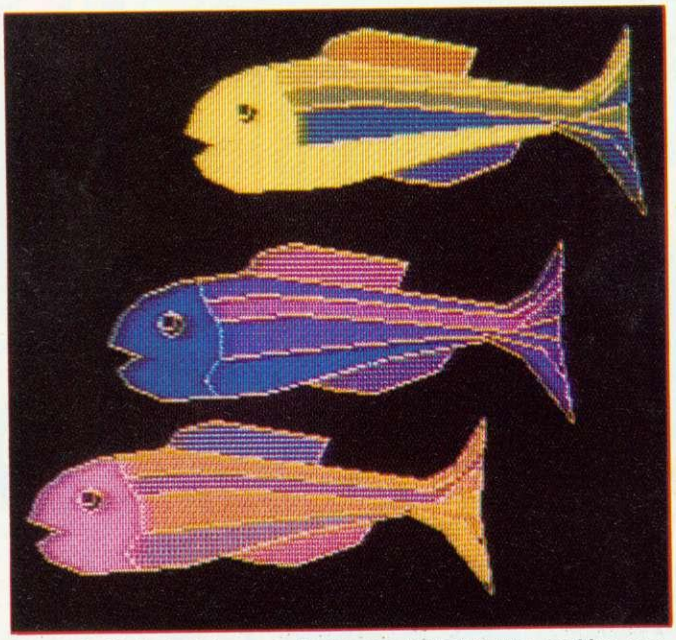


Figure 3. Mode 1 picture created on the Robot Plotter, making use of the repeat and multicolour pixel facilities

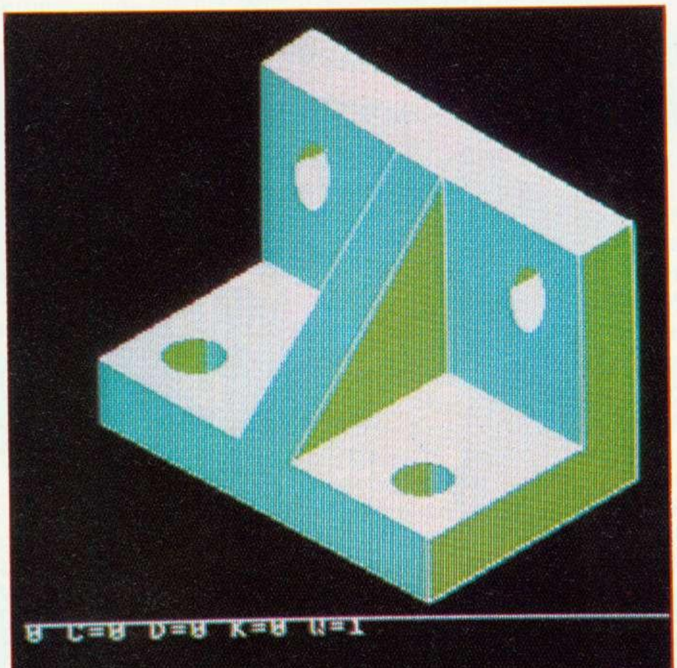


Figure 4. Mode 1 picture created on the Tarren Digigraph Mk II

- Drawing filled and outlined arcs and ellipses.
- Any rectangular block of the screen can be copied, pixel by pixel, to any other part of the screen.
- To assist with drawing fine detail, separate windows can be defined on the tablet and on the screen so that movement of the pointer within the tablet window will correspond to movement of the cursor within the screen window. In this way it is possible to scale up or scale down the movement of the pointer.
- One of the options for line drawing allows the length and angle of a line to be entered from the keyboard (not unlike turtle graphics), having established its starting point either with the pointer or as the end position of the previous drawing operation. This feature makes it very easy to create isometric drawings.

When the infill command is used to fill an enclosed area with solid colour, the number of screen pixels filled is shown in the prompt area at the lower edge of the screen.

As so many drawing options are available practice will be required before the user can get the most out of the software. To this end a series of worksheets and a booklet of exercises has been included. The worksheets contain shapes to be copied using various drawing techniques, and the booklet takes you step by step through the operations required. It's not essential to work through them all before producing your own drawings, but they provide a useful introduction to the use of the graphics tablet.

Conclusions

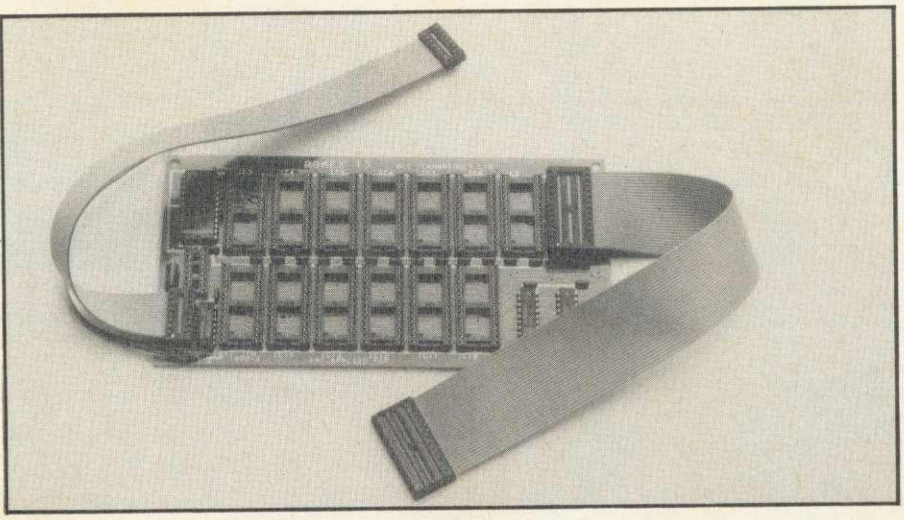
Both tablets are well constructed and the hardware performs well. Both, too, show evidence that a lot of thought has gone into their software.

The Robot Plotter, with its smaller range of functions, is probably easier and quicker to use for general-purpose drawing and tracing. The inclusion of simple and extended modes means almost anybody can produce pleasing screen drawings with minimum practice. Although the range of functions is limited, most things may be drawn without fuss. The only feature I felt lacking was that of arc and ellipse drawing.

By restricting the drawing functions to those most commonly used, enough



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THE VITAL CONNECTION

Romex 13 Expansion ROM board, GCC (Cambridge) Ltd, BBC, £45.94

MANY readers will know what a sideways ROM board is – an additional printed circuit board which connects into one of the five 'sideways' ROM sockets on the BBC and allows you to add extra ROMs or EPROMs. You might also think that that is about all there is to say, but not so.

This particular board is well made and appears to use good quality components. It also has decided advantages and disadvantages compared with other ROM boards. It will allow up to the full 16 additional ROMs – the maximum the operating system can support. It is also supplied with a comprehensive manual, mainly concerned with fitting instructions and suitable diagrams. Most ROMs you will come across will be 8k or 16k versions. However, the guide does show how to make minor modifications to the board to use 2k and 4k ROMs.

The board itself is fitted to the inside of the lid of the micro and therefore can be used in conjunction with a number of other accessories without interference, eg the Aries B20 RAM board. It also means that in this position, away from the main board, it is less likely to suffer overheating problems.

The main disadvantage will in fact only apply when fitting the board to certain BBC micros. There are three connections in all, two of which are straightforward. These involve inserting the main 28-way connection into one of the spare ROM sockets and removing an illustrated link on the micro to fit the second connection. The third connection is likely to be the main problem. It requires that you remove IC76 from the main board and insert it into the ROM board, replacing it with the 16-way cable supplied. This is easy to do as long as IC76 on your particular micro is in a socket. Unfortunately, mine is soldered directly to the board, as I believe many are nowadays. This problem is overcome by using an additional 4-way cable supplied and soldering it directly to the legs of the chip – *ugh!*

This can be done but is by no means easy. There is very little room to work in and unless you are an expert with a soldering iron I don't recommend it. I'm quite used to that sort of thing but still had problems.

Having eventually succeeded in getting it all fitted I tested the board with about 10 ROMs and it worked perfectly well.

Unfortunately, my whole attitude towards the product is tainted by the IC76 difficulties. I don't like anything that requires additional soldering or the like. If your chip is in a socket then it is well worth considering this product for the advantages it does provide, especially with the Aries B20; if it is not then I would not recommend it.

Ian Rowlings

TAKE TWO TABLETS

◀ *page 189*

memory has been reserved to store each drawing operation. I found the facility this gives to edit drawings extremely helpful. The use of 'superpixels' for filling means that mode 1 can be used to give reasonable line resolution while still offering about 15 fill 'colours'.

The more comprehensive software of the Tarren Digigraph Mk II is reflected in its higher price. With its extended range of functions it should be possible to produce high-quality drawings and diagrams for display on the screen, as transparencies or as printer dumps. The ability to use modes 1 or 0 while retaining full disc facilities is desirable if detailed drawings are required. Although lacking the picture-editing facility of the Robot Plotter, the ability to copy and move blocks of the screen and selectively erase parts of it allows corrections and alterations to be made.

A MONITOR ABOUT THE HOUSE

Philips TP200 monochrome monitor, Telefusion Communications, Unit 9, Barrs Fold Close, Wingates Industrial Park, Westhoughton, Bolton BL5 3XH, £83.80

ANYONE using a TV as a computer display will, at some time, have thought of buying a dedicated monitor. Not only do they free the TV, they give a much improved display. Further, they overcome the problems which can be caused by TVs interfering with the computer's video signal (frequency 'beating') which tends to make the picture unstable.

The Philips TP200 is a black and white monitor with a green phosphor display on a 12in screen. It has a worst case resolution of 700 lines and a frequency response of 18MHz: in plain language this means it can more than cope with an 80-column display and the Beeb's highest resolution mode.

The monitor is nicely styled and has external controls for: on/off; brightness; contrast; vertical hold; horizontal and vertical centring (nice touch that!). Internally there are controls for horizontal hold, focus and voltage. The unit is cased in impact resisting plastic, with a fold-out stand, and, at 8kg, is lighter than most 'portable' TVs. It uses a standard 1vpp composite video input and connection is via an RCA-type (phono) jack.

In use, it was found to be totally reliable on both the Atom and the Beeb, giving good picture resolution. There was, however, a noticeable degree of 'persistence' (the image remaining on the screen after blanking). This was confirmed by the supplied retrace times, which were 11μs for horizontal trace and 1.2ms for vertical trace. While this would not be a problem for a domestic user, it could cause fatigue for someone using the monitor continuously. That aside, the unit was a joy to use and the price makes it an attractive proposition for any home user. It comes complete with a multi-lingual instruction booklet and a circuit diagram.

Special prices are available for bulk orders and for bona fide computer clubs. I can recommend this unit as a worthwhile and value-for-money buy for domestic users. **Barry Pickles**

THREE LANGUAGE LEARNING PROGRAMS

TAKE A RAP ON THE KNUCKLE

'Vocab – Five Language Learning Aid for the BBC Micro', Beebugsoft, PO Box 50, St Albans, Herts, £10
'French Tutor', BBC, Salamander Software, 17 Norfolk Road, Brighton, Sussex BN1 3AA, tel (0273) 771942, £9.95
'The French Mistress Level B', BBC and Electron, Kosmos Software, 1 Pilgrims Close, Harlington, Beds LU5 6LX, tel (05255) 3942, £9.95

THESE three programs seem to be representative of what's happening on the language-learning front as far as micros are concerned. Much as many of us would like to believe that computers make marvellous teaching aids in this area, the results all too often don't live up to expectation. In effect computer software tends to reduce both itself and its pupils to the level of parrots.

Let's start with the Beebug program. This comes equipped with the program *Vocab* followed by 'starter' vocabularies in French, Italian, Spanish and German.

For reasons of space, I'll confine my comments to the French version. The vocab test slings words at you, answering 'correct' or 'wrong' according to your response. The function keys are used to place accents on the words.

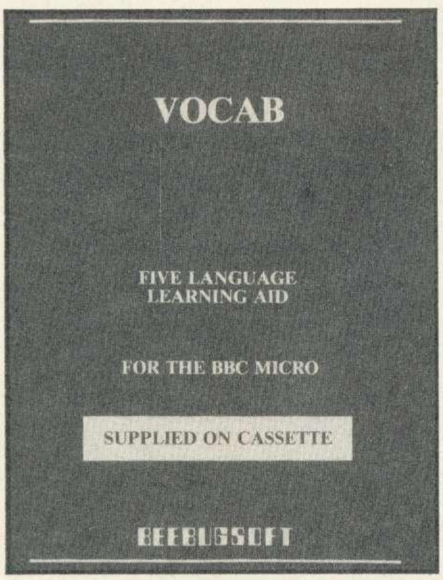
Unfortunately, the slightest disagreement between the user and the machine produces 'wrong', however trivial the fault. At first, I found it mildly irritating to discover that 'to advise' is the wrong response to 'conseiller'. 'Advise' alone is the correct answer. My irritation increased when my responses to 'surtout' and 'volontiers' – 'above all' and 'willingly' – were also 'wrong' ('especially' and 'gladly' are the only accepted responses). Yet my Harrap French-English dictionary gives my word as its own first choice of translation for the latter.

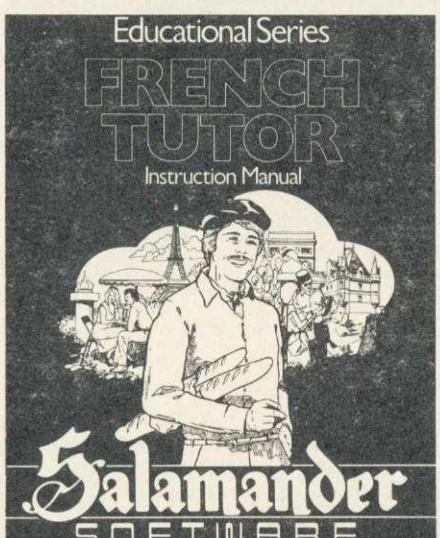
Far worse than this, however, is that in the space of 10 words I was given 'paques', 'mars', 'angleterre' and 'je suis'. In each case the program accepts only 'easter', 'march', 'england' and 'i am' . . . My old French teacher would have rapped my knuckles for such lower-case abominations.

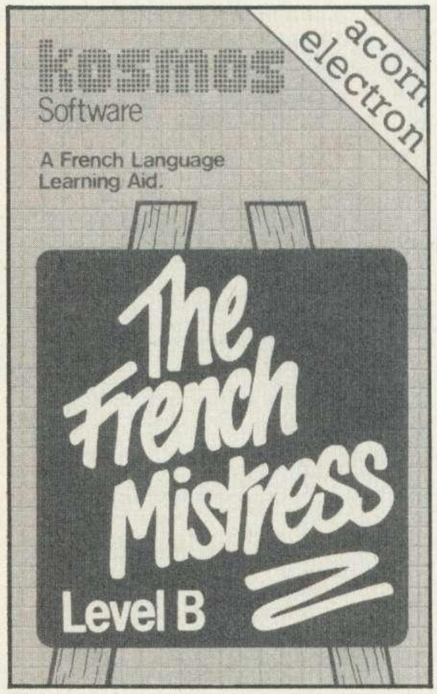
The other two programs suffer from the same lack of flexibility, though not in such extreme degrees. The Salamander Software package covers general vocab, irregular verbs and idioms. I found the program tedious to use, with strange use being made of the function keys for compatibility with the 0.1 Operating System (surely a thing of the past now). The function keys are also used to enable you to put French accents on the words, a tortuous process made only just acceptable through the use of an overlay card.

The Kosmos Software package is probably the best of the bunch, although it is also little more than a rigid database. It is a menu-driven program with nine options, although only two of them are related to learning (the others relate to creating new lessons and tape I/O).

Option 2 displays a word or phrase in one language for a user-specified amount of time; it then displays the translation for another specified amount of time. The best feature is that masculine and feminine words are shown in different colours.







Option 9 is supposed to test your translation abilities but won't allow an incorrect answer. If you press a wrong key the program beeps – and won't allow you to use Delete. Non-perfect typists will find it wearisome to have to press Copy to continue, at which point the program provides the next letter. At the end of the lesson a table shows you how many questions you answered correctly – ie, with no typos – and the number answered incorrectly: ie, the number of answers with typing errors which the program wouldn't allow you to correct.

All three programs offer the facility to write your own vocabularies but in no case does the problem of flexibility ease. Surely it is not beyond the imagination of a programmer, especially on a machine with really fast Basic like the Beeb, to introduce a little analysis into the answers. Thus, if the problem is merely one of upper or lower case, or a simple typing error, it's not asking too much of the program to give the user a line like: 'I think you're nearly there, please try again.' Similarly, any program which can't give a response other than 'wrong' to synonyms or near-synonyms can hardly be described as a learning aid.

Learning vocabulary by rote is somewhat out of fashion these days, but even my old teacher, who was a stickler for making O and A-Level pupils learn from 10 to 25 words a day, would have given these programs the electronic equivalent of a rap over the knuckles.

Would-be students of French are advised to put their money towards a day-trip to France.

Simon Dally

BASICALLY IMPURE BUT FUN

'Quality Programs for the BBC Micro' by Simon, Micro Press, £6.50, 207 pages (program tape £9.45)



THE book is split into five sections and contains 18 programs. The sections are headed Applications, Educational, Graphics, Games, and Mathematical.

The programs themselves are not remarkable, although they are probably as good a collection as I have seen in the flood of computer books now available.

What is really good about this book is not so much what the programs do but how they are written. It does much to advance the case for structured programming, mainly because the author never falls into the trap of being pompous or messianic. His nice, subtle sense of humour, evident throughout the book, makes it a pleasurable read. He is not afraid, on the odd occasion, to use GOTO but this almost seems like devilment on his part. Purists may also take exception to the technique of providing multiple exits to functions, as in the *Tachistoscope* program, but it adds to the fun.

The section for each program has an introduction explaining what it does and how to use it, the listing, a good blow by blow explanation, a discussion of each new technique used and suggestions for modifications. There are examples of just about every type of Basic program you could want, with the exception of utilities, each excellently written and clearly explained.

With a few exceptions the programs are not over long and I don't think I would bother buying the optional tape. It is often quite a good exercise to type in programs – if they are accurately printed, as these appear to be.

What I most enjoyed about this book is the feeling it gives that the author had a good time writing it. After all, if he was bored you probably will be too. I recommend it to anybody wishing to improve his or her Basic programming technique and have some fun doing it.

Harry Sinclair

COLOURFUL PRIMER

'Step-by-Step Programming' (Books 1 and 2) by Ian Graham, Dorling Kindersley (London), £5.95 each

MANY people entering the world of computers seek a book that explains in plain, readable English the language of their computer and its applications. These books do this by beginning with the basics and progressing to more complex forms of programming in easily followed stages.

The books explain in detail the layout



and various parts of the computer, Basic commands, first programming steps and the more advanced rudiments of graphics, sound and games programming. A section dealing with the conversion of other computer languages to BBC Basic may be useful to some users.

The books are extended versions of the BBC user guide but the lucid illustrations and accompanying text make them more interesting to read and use. Thus the reader is more likely to use the books in conjunction with the computer than read them as one might a novel, and to supplement reading by practising the skills learnt. The programs illustrate well the topics discussed.

An attractive inclusion is the addition of photograhs of the screen output when the listed programs are entered and run, but when used to present the program listings this format has its drawbacks, for the small compressed print makes entering mistake-free programs difficult. The size of the books could also present a problem for the user who works in a small area.

The incluson of flowcharts in Book 1 is helpful and they should have been used throughout the book to explain program design, especially in the sections on games programming.

The glossary at the back of both books is handy for the newcomer but the index is rather limited and deals mainly with the commands used.

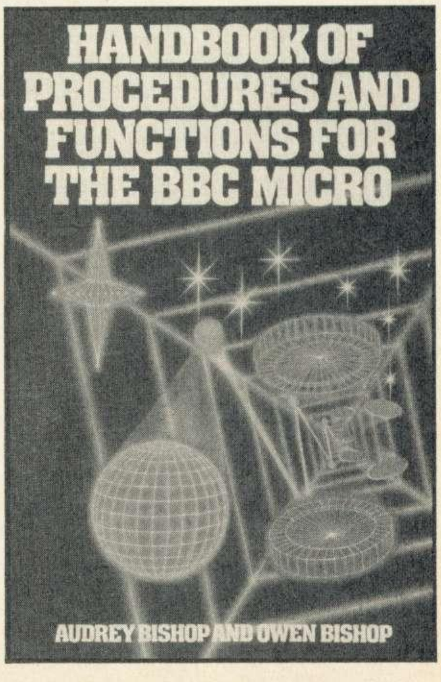
To sum up, these two books are comprehensive guides to the operaton and programming of the BBC micro for student computer users or those who wish to broaden their knowledge. They would be a helpful, colourful addition to all but the most proficient micro users' bookshelf.

Wendy Nash-Steer

WHATEVER TAKES YOUR FANCY

'Handbook of Procedures and Functions for the BBC Micro' by Audrey and Owen Bishop, Granada, 143 pages, £6.95

THIS is the 13th book from Granada for the BBC micro and I think they're getting a bit short of ideas. For your £7 you



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LMOVE is used to position the LOGO cursor, usually used prior to further LOGO statements.
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ADVANCE is used to move the cursor in the direction as set by ANGLE by the distance described in the ADVANCE statement.
TURN gives the cursor a new direction by turning it a certain number of degrees anti-clockwise from its previous direction.
PEN defines the kind of trail left by the LOGO turtle using the internal plot codes.
LCIRCLE and LELLIPSE are the LOGO equivalents of the similar enhanced graphics commands, the shape centre being the current LOGO cursor position.
LPOS is used to return the position of the LOGO cursor from a SCALEd screen.

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GREPL and SREPL are two related commands that enable the user to replace a character or group of characters with any other character or group of characters, under total control of user.
LVAR is used to list all, or alphabetically selected, variable names currently within memory.
VERIFY is a simple command to confirm that a copy to tape or disc is exactly the same as the original program in memory.

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get 70 listings of procedures and functions and an introductory chapter explaining what they are.

Dealing with graphics first, there are procedures to draw circles, animate and rotate characters, and simulate an explosion. The best one is for scrolling the screen sideways or downwards. The three sound effects programs simulate gunfire, a spaceship and the BBC time pips. There are procedures that do strange things with lists of words and – tricky one this – a procedure to calculate averages.

The functions cover mainly mathematical and string applications: anagrams, number bases, factorials, yes/no validation and some functions to read the various 6502 registers.

None of the procedures or functions is particularly novel and some are very trivial. I typed in half a dozen of each and found two mistakes: ENDPROC had been missed off one procedure and in another the Owens got their formal and actual parameters confused. Still, there might be a few routines here that take your fancy. **Geoff Nairn**



BIG HELP FOR SHORT PEOPLE

'Take off with the Electron and BBC Micro', by Audrey and Owen Bishop, Granada Publishing, £5.95, 144 pages

THERE are 11 programs in this book, all quite short, and all in Basic except the last one, *Attack*, which contains some assembler. It is obviously aimed at younger people who are fairly new to the two machines and the authors go out of their way to be helpful. There is a gentle introduction to the basics of the PRINT command in a chapter called 'Your Briefing' and then you're into the programs themselves.

I like the layout of the program chapters. There's a general overview of what the program does, the listing, a clear flowchart, an explanation of how the program works set out in exactly the same sequence as the flowchart, a discussion of each new keyword introduced, and finally suggestions on extending the program with tips on how this may be done. In addition, in chapters where a new idea has been brought in – such as file handling, rounding numbers, or formatting output – there is a section called 'The way to do it'.

The programs range from simple games such as *Stunt Car* and *Attack* to spelling tests, tune learning, weather forecasting, birthday files and keeping track of your pocket money.

The book would make a nice, instructive present for any short person of your acquaintance who is even mildly interested in the new black art. **Harry Sinclair**

SIMPLE BUT MARRED

'Child's Play' pack, Dial Soft, 72 Downend Road, Downend, Bristol BS16 5UE, BBC, £6.95 (disc £8.50)

THE *Child's Play* tape consists of the following four programs: 'Numberbond', a program designed to help the child learn simple arithmetical bondings; 'Spellaway', a spelling and multiplication tables tester; 'Shapes', a program to show the relationship between objects of different shape and colour; and 'Fractions', which tests and develops perception of the relationship between a fraction and the original whole.

All these programs are brightly presented in a pleasant format and are easy to use. As they are intended for the early learner they need to be set up by an adult ready for the child's use. They all appear to do what they set out to do but there are aspects that mar the overall picture. Spelling programs should be scrupulously checked for spelling and grammatical correctness and yet Spellaway contains at least two major spelling mistakes as well as misplaced apostrophes. Moreover, the categories of words and their contents were peculiar – especially as this is supposed to be Child's Play! How many adults would expect to know the meaning of 'frequentative' or 'quadrumanous'? And is 'intumescence' really a child's word? This criticism applied to most sections of this program but fortunately was counteracted by the fact that one could create one's own word lists.

Having made that criticism it must be said that the simple and straightforward programs offered by Dial represent good value for money, especially if the programs fill a particular need for your child or your class, and – yes – they can be transferred to disc! **Nick Evans**

PLUG-IN SECURITY

Security ROM, Software Services, £15

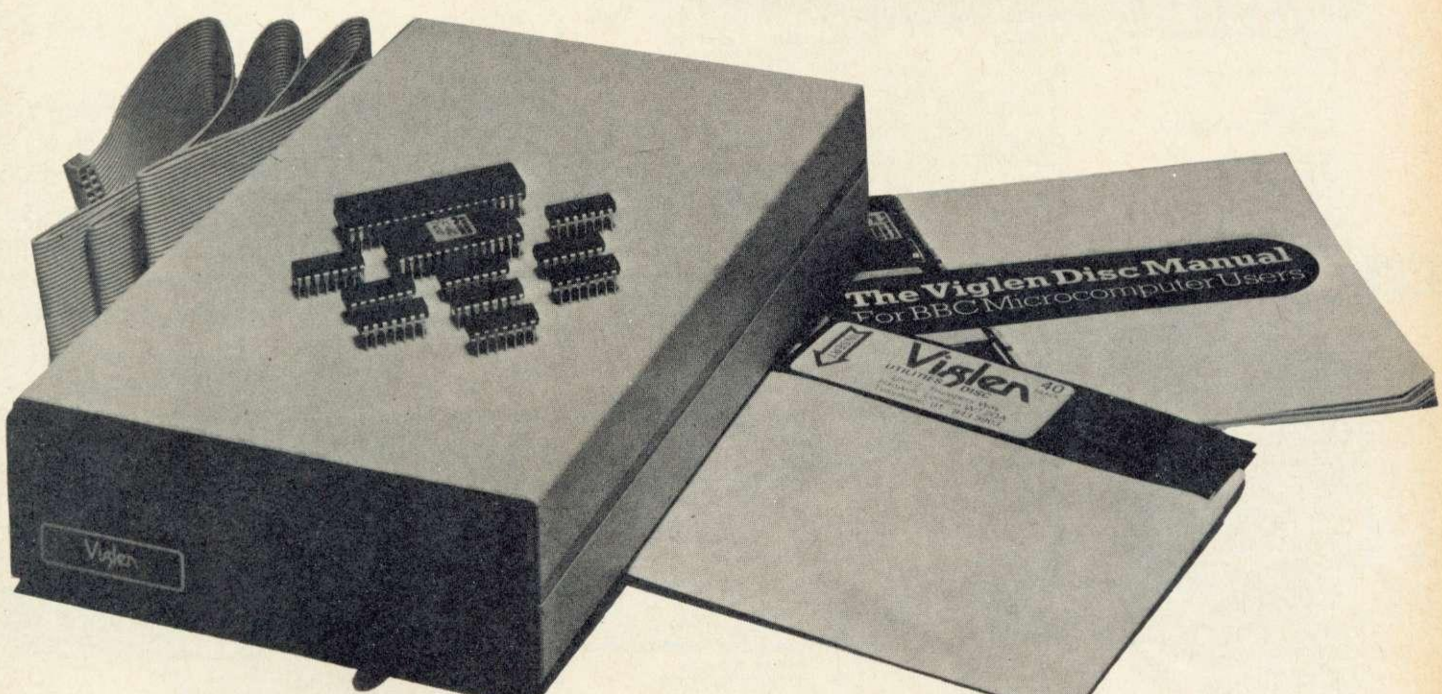
THIS device is supplied on an EPROM that plugs into the right-most ROM socket (IC 101) or the first ROM socket to be accessed on power-up. It is encoded with your own personal details and a five-character alphanumeric security code. When you switch on the details are displayed and you are required to enter the code before being allowed to continue. The code is not, of course, displayed and if you make a mistake while typing it, the device will either reset itself after receiving five characters or you will have to press Break and start again. As it is not designed to be user-friendly – for obvious reasons – no prompts are given.

An additional feature is *SEC. Typing this command while the machine is in use provides a temporary software lockout. You can recover from this without loss of program, but I don't want to give too many secrets away!

I wonder, however, how effective such devices are as a deterrent. After all, if it is that easy to install it is just as easy for anyone with a little common sense to remove, rendering the micro bog-standard and traceable only by its serial number. For those more conscientious I suppose you could go to the trouble of removing the ROM socket and soldering the device in permanently. It's certainly a possibility but again one that could be overcome by the more determined criminal.

Whether or not a device of this type serves a useful purpose and is value for money is a personal attitude. If it provides what you are looking for then it is obviously worth having. An important question is whether the supplier will change the device if your personal details change. **Ian Rowlings**

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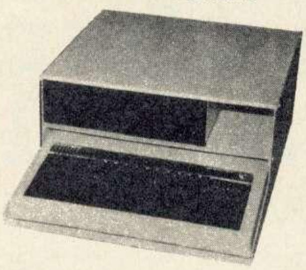
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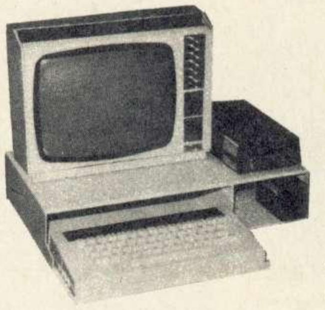
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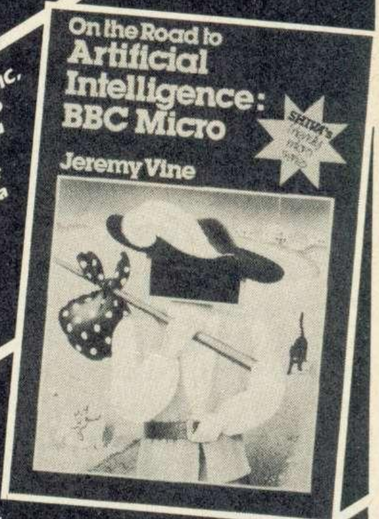
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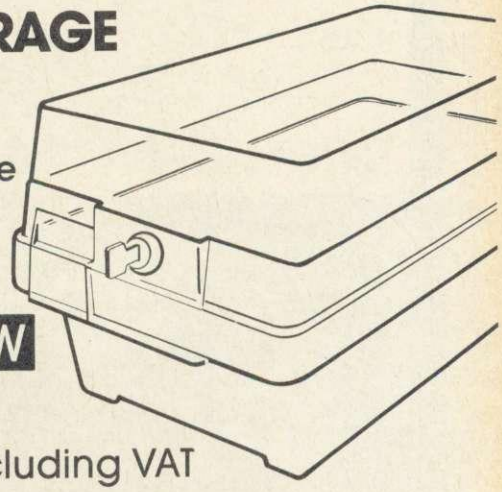
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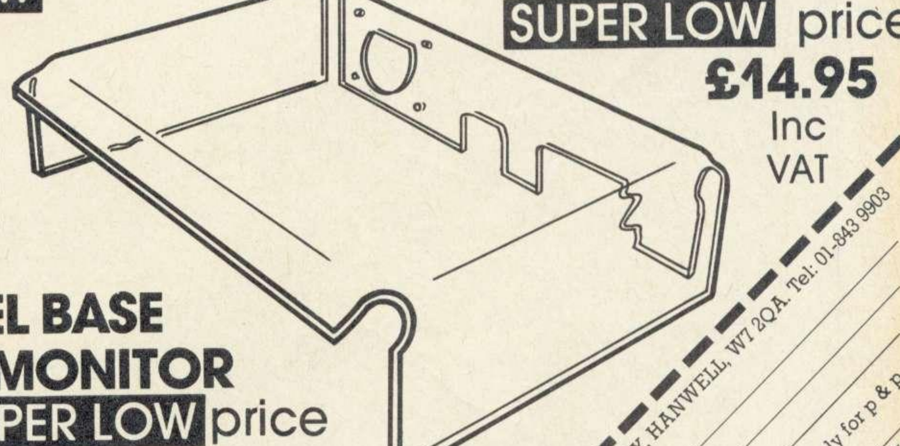
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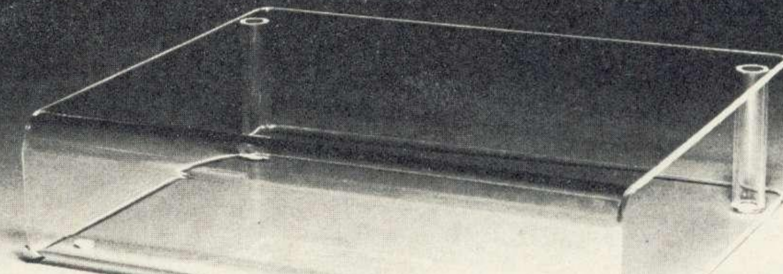
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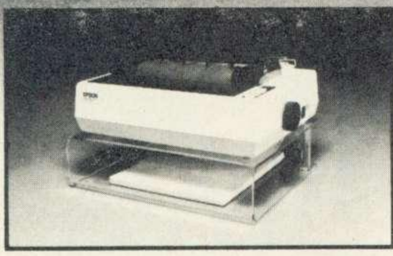
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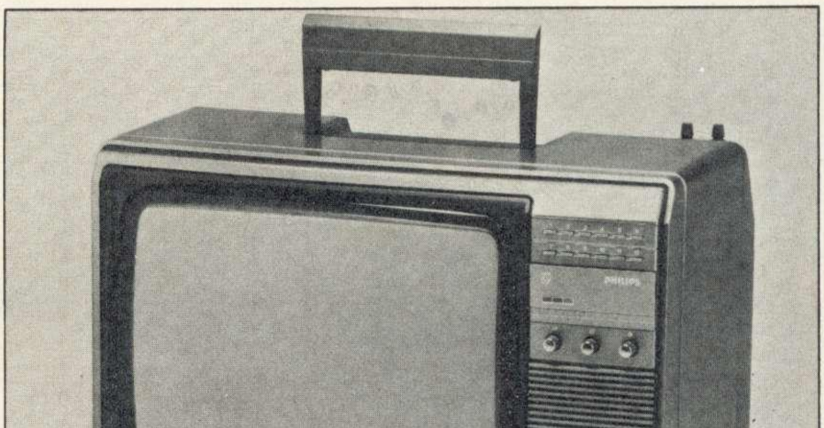
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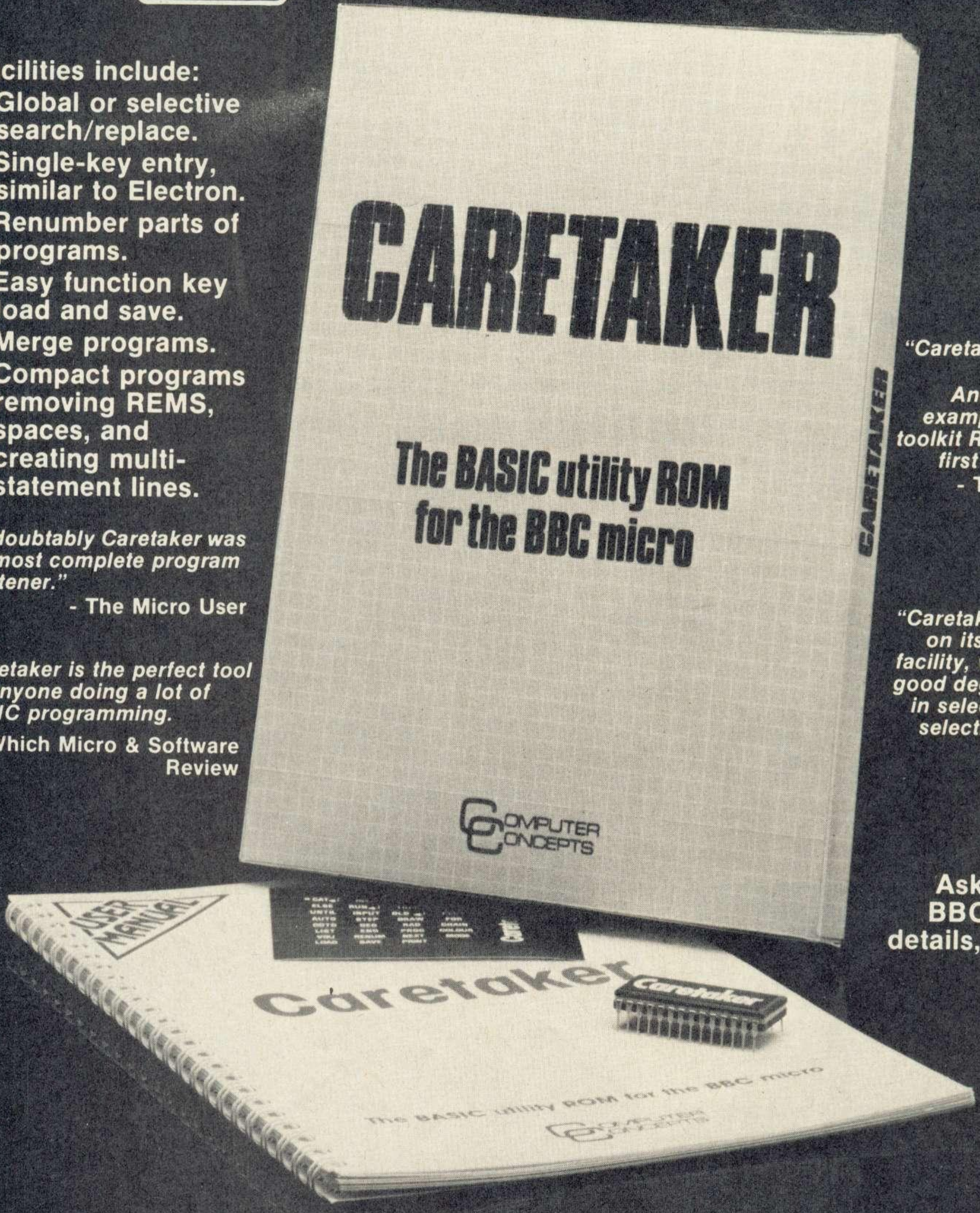
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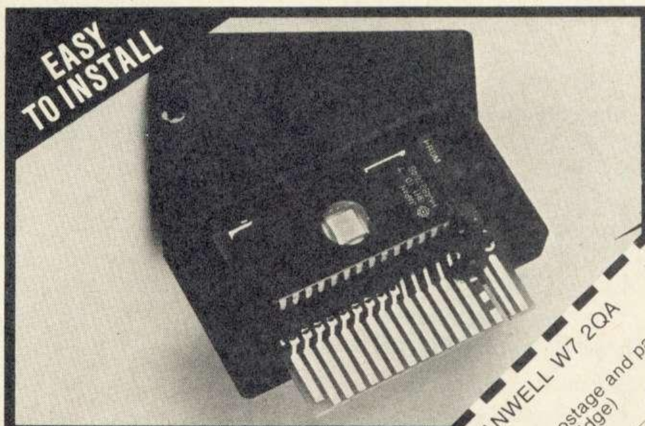
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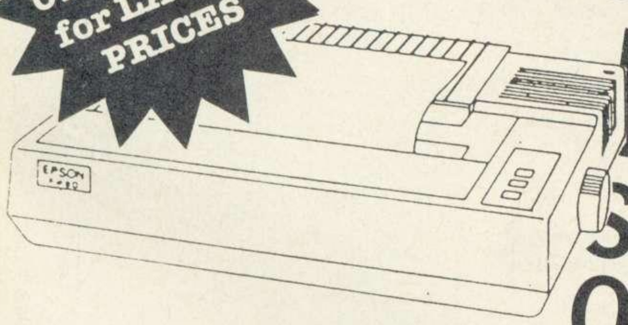
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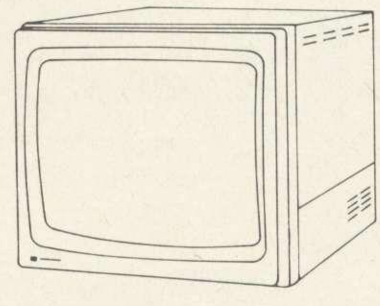
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NEW — ONESHOT: £12.00 DISC

- Full feature trace utility.
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ONESHOT is a 1.25kb machine code program which gives the user several powerful aids in debugging BASIC programs. These include the ability to SINGLE STEP through the BASIC code of the target program, stopping the processing at specified points and comprehensive trace functions of the variables used by the target program.
A very powerful option allows the user to enter a command string into function key 0 and instruct ONESHOT to obey this command BEFORE each line is executed e.g. *KEY0 PRINT X%¦ M will print the value of X% before executing each line. This is a very simple example and it is possible to do much more complex things including printing the value of a variable only when it changes or when it reaches a certain value or falls within a certain range. This option can also be used to dynamically alter ONESHOT as it is working. The power of this option is only limited by the users ingenuity. In addition to ONESHOT the disc also contains 3 very useful function key routines. The first will search for any DEFPROC or DEFFN and print the line numbers in which they appear together with the name of the procedure or function. The second will search for a specific procedure or function and print the line numbers containing it. The third routine will print out every active variable together with its present value.
ONESHOT is not compatible with double density interfaces.

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Acorn User has been alerted to the abuse of the free ad service and, regrettably, can no longer accept entries selling or swapping software.

WANTED: Acorn Atom PSU 1·3 Amps 5-volt. Tel: (0203) 81727 and ask for Richard.

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WANTED disc interface, preferably with Watford DFS but others accepted. Must be under £50. Write to C.Mo, 49 High St., Downham Market, Norfolk. Will phone back if wanted.

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WANTED File-plus owner who can demonstrate program. Reasonable distance Petersfield/Portsmouth. Please telephone 0705 592489 after 5 pm weekdays, else anytime.

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TELETEXT adaptor for BBC micro, £150. Ian Coulson, 26 Westmorland Rd, Felixstowe, Suffolk IP11 9TS. Tel: Felixstowe 272452.

BBC B 1.2OS, Acorn DFS, Wordwise, software and books worth £100, all for £399. 400k double sided 40/80 disc drive £175. Mannesmann Tally printer £200. Drive and printer guaranteed. Tel: Leeds (0532) 732113.

WANTED Information on RTTY. Also does anyone listen to Armed Forces Radio and TV service? If so, what receiver are you using? Write to G. Hart, 92 Carfield, Skelmersdale, Lancs WN8 9DN.

ACORN JP101 parallel printer for BBC B. Brand new duplicated gift; £170 ono. Includes manual, lead, paper, graphics dump tape. Tel: Ruislip 73671 (Middlesex) after 6 pm or weekends.

FOR SALE ZX81 plus 16k RAM. Including games and books £40 ono. Tel: Marton Heath 411 (after 6).

ATOM disc pack contains disc drive, power supply, disc interface etc. With manual, connecting ribbon, cable & utilities disc. £150. Tel: Maldon (Essex) (0621) 56137, (Roy Burgin), evenings and weekends.

WANTED – Epson printer, RX80FT or FX. Must be perfect for use with BBC. Up to £150 cash waiting. Tel: Cardiff 615595.

ELECTRON, three months old, £60 worth of software and books, £170. Tel: 0953 454902 or write to 3 Dairy Farm Court, Attleborough, Norfolk NR17 2BT.

CASIO FX-502P programmable calculator and FA1 music and cassette I/0 interface, manuals & tape. Sell for £45. Casio FX-700P pocket computer, qwerty keyboard, 1.5k, sell for £40. Tel: (061) 624 5284 after 5.30 pm.

TANDY CGP115 colour printer/plotter, together with spare pens, paper and BBC parallel lead. Bargain at only £85 ono. Tel: 0242 37954.

SEIKOSHA GP100A dot matrix printer with centronics interface to suit most computers. Ten months old, £120. Tel: Morecambe (0524) 411780 after 6 pm and ask for Vincent.

DISC drive, double sided SD/DD, 35 track with leads and manuals, software included, utilities, in good working order, £75. Tel: Nottingham 53312. 99 Kenrick Rd, Mapperley, Nottingham.

ATOM. New user club £6 membership. 4/6 newsletters annually. Original software wanted for use in above. Send tape, listing & SAE. Money for best. Martin, 11 Courtfield Road, Ashford, Middx TW15 1JN.

EPSON RX80 for sale, box and manual, £200. Tel: Geoff Spring, 0494 783071.

HELP! Anyone know how to connect an Electron to a VCR (via video in-socket) in order to record colour graphics? B & W is boring! John Heavyside, 66 Farley Way, Reddish, Stockport SK5 6JD. Tel: (061) 431 4169.

PRINTER Star DP510 + BBC cable. Original packaging, still under guarantee, 2.4k buffer roll, tractor, friction feed, Epson compatible. Cost £300 + new, bargain at £215. 100 CPS 80 cols. Tel: Mike, Abingdon (0235) 25480 evenings.

BBC B, latest OS, DFS, 100k Viglen drive, discs, Wordwise fitted, leads, manuals. Plus Docsoft 727 and Which? Taxcalc. Six months old, boxed. £499. Manning, 105 Station Road, March, Cambs. Tel: 55284.

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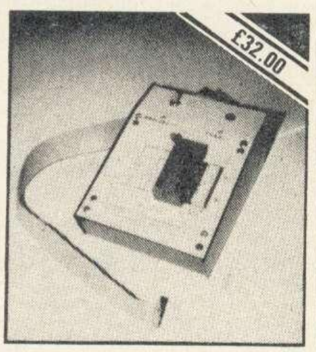
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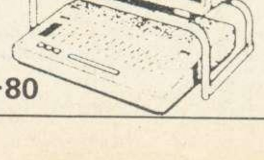
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Bargain software BBC/Electron. Minimum 15% discount, up to 50% discount! Special offers only best titles. SAE to Coastal Software, 17 Pembroke Gardens, Holland-on-Sea, Essex.

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BBC B Viglen's DFS £385. BBC B Acorn DFS £365. Epson MX-100 F/T £245. Zenith 12" green screen £55. Disc drive $5\frac{1}{4}$" D/S 40-track (uncased) £65. Watford (0923) 33118.

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BBC/Electron library. £5 membership fee. Tapes £1+23p p&p. Large selection. Stamp for details to: E. Tucker, 58 Blenheim Walk, Corby, Northants.

BBC keypad. Speed up data entry with 25-key add-on. Eliminates Shift for + * = etc. SAE for details. Extron, 16 Priory Park, Bradford on Avon, Wiltshire BA15 1QU.

BBC micros inoperable without your password. Embedded, encrypted IC, reveals proof of ownership on request. OS1.00 onwards. Send name, address, password, 12 characters max. £18. M. Gillett, 135 Honey Lane, Waltham Abbey, Essex.

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Cross assemble and dis-assemble 6805 microprocessor code on the BBC micro. In EPROM £20, on disc or tape for sideways RAM £16. SAE for full details. N. Jenkinson, Brosscroft, Hadfield, Via Hyde, Cheshire SK14 7HE. Tel: Glossop 66207.

Daisywheel printer, new, boxed, £230 including dust cover and Centronics cable. Tel: 01-836 0589 business hours, (09326) 5239 weekends. Ask for Mr Martin.

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Frustrated? Chrismas Disc Logger will read your directories, sort, search and print a catalogue. Indispensable! Cheques £6 to Bacsoft, 81 Village Road, Gosport, Hants. PO12 2LE.

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Juki G100 daisywheel printers. New/guaranteed, £369 including VAT. Free delivery in UK. Also disc drives from £95 delivered. Woking (04862) 62020, anytime.

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Micro Arts – new independent computer art magazine and software. Issue One: micro music/language as virus/electronic Beowulf/film/video/more. 90p including postage. Software: BBC model B graphics (6 programs) by Martin Rootes – £3. Spectrum software also available. Micro Arts (A), PO Box 587, London SW4 9PH.

Money, money, money. Proven programs for all horse racing or football pools forecasting. Send £12 to The Butronics Co, Penterrick House, Budock, Falmouth, Cornwall.

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Random access mailing list for BBC micro. Holds up to 300 addresses. 40 track disc £12 from D. S. Buckley, 46a Pinner Road, Harrow, Middx HA1 4HZ.

Sideways ROM extension cartridge system. Includes easy change cartridge to protect ROM. Located on LHS of keyboard. £17.95 inclusive, (extra cartridges £4 each). SAE for details. Steelappeal, 3 Hambledon Close, Blandford, Dorset. Tel: (0258) 53742 anytime.

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ACORN USER ADVERTISEMENT PAGES – NOVEMBER ISSUE

FRIDAY TELEVISION

BBC 1

1.45 Postman Pat
Once Bitton twice shy. A *See-Saw* programme (*Repeat*)

2.0 King Kurry
FILM In a remote corner of Cambridge, geologists in search of chips discover Kurry – the eighth wonder of the world – a 50-foot ape who 'rules' his company like a god. Introduced to London society, King Kurry escapes from his cage in Covent Garden and runs amok. Director **Steven Iceberg**'s last film: 'Never work with animals and kids' being the verdict.

Apes .... ACORN R&D
Make-up .... PETER O'COIFFURE
'Hold Me, Touch Me' Old Lady .... FAY WRAY

3.35 Tom and Jerry
Cartoon fun with marketing men Tom Horrorfilm and Jeremy Pastry.

3.50 Play School
Jack Tramplesonpeople and **Uncle Clive** take younger viewers for a ride and ask 'is the clock a prop or an electrical device?' If you think this is bad, you should see some of the educational software.

4.10 The Rombles
Making good use of the EPROMs we find.

4.20 Cartoon Time
Viewers with two Crays and ten Vax computers to spare can tune to André and Wally B on Unix. For those with Ceefax, it's Ballblazer and Rescue on Fractalus.

4.30 Frakanory
The tale of the Aardvark and the Pilchard.

5.5 Blue Peter
In a classic compilation **Lesley Judder** goes earthmoving, **Peter Pervert** reviews video-game nasties and **John Networks** makes an ABC with a written-off Volvo, a wine-soaked keyboard and a bag of French fries.

Producer .... SMILEY MERRIMAN
French fries .... BARBARA COLD

5.30 *Trek
While the Enterprise adventures on with Elan, the ageing FX calls you to boldly toggle to ITV for less punishment.

Technical effects ...... LORRY HARDWIRE
Choreography .... MIKE BIGNOSE

6.0 The Six O'Clock News
Kenneth Kendall drones on while **Sue Lawless** and **Angela Nippon** play Joe Telford's game 'Let's make Ken say naughty words'.

6.15 Dr Who
An anonymous timelord arrives in the star system Gemini looking for intelligent lifeforms. Unable to find any, he crashlands on Earth and takes a job as R&D director with typewriter makers Acorn while looking for a new car.

Burns effects .... HOWARD FISHEY



Everything has to be just so as Tony Quinnine of the Elite Squad prepares for the safari.
BBC1 3.50 pm Play School

6.30 Tomorrow's World
The trendy team reports on the Acorn Business Computer: Sixth generation or 1986? **Jumpsuit Hahn** interviews the PCW Show.

7.0 Top of the Pops
Featuring Frak goes to Hollywood, Michael Jackson's Thrilla Gorilla, the Aubrey Singers and (straight in at number one and Oric Muser still don't know who Commander Jameson is) a live performance of Elite from the Acorn Softies with backing vocals from the Family Planning Advisory Service.

Your DJDs ... IAN MACNAUGHTY-DAVIS
JOHN 'DOO-BOP' COLL
Dancers .... JOHN WINECASE AND THE PROMOTIONELLES

7.30 Gardeners' World
from Altrincham
with **Shirley Conflab**
Earthy Shirley takes Chris 'to the manor born' Curry down the garden path for a tour of the flower beds. Shirl's helpful hints include how to treat forget-me-nots and exactly how much manure to put on red roses.

Conan .... HERSELF
Barbarian .... HIMSELF

8.0 Life on Earth
David Atomboard explores the great Redwood forest of Long Odour and discovers Ward-hogs, Someren slugs, and bony Quinn-fish. Not for the squeamish.

Six-legged bugs .... CHAS MIRE
Welsh leaks .... BOB PICKERING

9.0 The Nine O'Clock News
with **Richard Witless.** Weather Guesser with rain-loving **Michael Fish.**

9.25 The Survivors
An accident in Hermann's particle physics laboratory wipes out all but a few of the world's computer companies. The survivors struggle to rebuild civilisation and force the share price back over 120p. This week – combatting Dutch Oak disease.

11.0 Micro Live
How does a nightmare begin? For John Coll and Lesley Judder it began on BBC-2 at 6pm when trying to load paper into an Epson during a printer review.

Daisy Wheel .... DAVID ALLIN
Tea Boy .... PATRICK TETLEY
Freff .... BORIS KARLOFF
Epson .... ROBIN FUDGE
Topical Piece .... CLIVE PENGUIN

11.40 The Good, the Bad and the Elkey
FILM Western: Torch cowboys against Indians from Watford in which Clint Redwood gets his come-uppance from the evil, cheroot-smoking Mad Alex van Cleef. Music courtesy of Generator from Quicksilvasurfer.

Man With No Name .... ROBBER MCMILLAN
Greasy little Mexican ...... SIMON DALLY
van Cleef .... GBH

1.15 am The Epilogue
Comedian **Mark Colton** talks about why Wheelchair is an invalid command in View.

1.30 Closedown
Bill Cotton explains why he took Acorn Abuser's Diary off the air: 'You didn't tell the one about Aubrey Singer's garage being called The Fuehrer's Bunker because it's so full of technical gadgetry.'

THE WEEKEND STARTS HERE

SATURDAY
To remind us that Summer's nearly over it's the **Last Night of the EPROMs** on BBC1 with The Tube pushing out some high-speed stuff on BBC2. Meanwhile, Music Box brings us the sounds of Ceefax.

SUNDAY
Chess enthusiasts will welcome the first of ten programs on the World Championships between White Knight and Dontee Carpon.

WEEKDAYS
Finally for all fans of old lace, buck teeth and pebble-dash spectacles, we have the return of the ever-popular **Dear Ladies** starring Dr Maria Hauser and Hilda Bracket.

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ACORN ABUSER'S Diary



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